

# LLOYDIA

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### The Genus *Lecidea* in the Adirondack Mountains of New York<sup>1</sup>

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#### Introduction

The Adirondack Mountains occupy an area of 5000–6000 square miles in northern New York. In this area the habitats for lichens are of remarkable diversity, embracing a range in elevation from 700 to 5300 feet above sea level, many kinds of rock substrata, forests of varied character, and large areas burnt over sufficiently long ago to have permitted extensive colonization by lichens. Although readily accessible, this region has been almost entirely neglected by lichenologists. Its lichen flora, known only from a few collections by C. H. Peck and others, is presumably like that of the adjacent New England states, which have been surveyed more intensively than any other area of equal extent in the Western Hemisphere.

The aspects favorable for lichen study in this area as given above induced me to make a general collection of lichens on and about Mt. Marcy, the highest mountain in the state. This collection yielded over 50 species of *Lecidea*, many decidedly beyond their known range and some proving to be previously unrecognized species. The collecting was continued, limited, however, to species of *Lecidea* as nearly as could be determined in the field, until some 3500 collections were made, of which over 900 were pertinent to this study. Certain areas, selected because of accessibility and because preliminary studies indicated their fertility, were intensively surveyed; these were:

1. Mt. Marcy, near Lake Placid. The localities of principal interest were:

a) The summit of Mt. Marcy, the highest point in New York (elevation 5300 feet). The zone above 4900 feet is relatively free of trees and thus

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<sup>1</sup> Paper from the Department of Botany and the Herbarium of the University of Michigan, No. 694, and the Department of Forest Botany and Pathology, New York State College of Forestry at Syracuse University.

a favorable area for lichens growing on rocks and soil. The life conditions are extremely severe, as indicated by the physiognomy of the herbaceous and shrubby vegetation, and the arctic affinities of the flora.

b) The bed of Marcy Brook north of Mt. Marcy, from Indian Falls (elevation 3500 feet) to Avalanche Camp (elevation 2500 feet). This proved to be a favorable locality for saxicolous species requiring shaded and humid habitats. A very similar locality is

c) The sides and bed of the dike leading from Avalanche Lake (elevation 2860 feet) up the side of Mt. Colden to about 3500 feet elevation.

2. Chapel Pond, near St. Huberts. The feature of principal interest was an extensive talus slope facing west in a deep valley between two high mountains. The base of the talus slope lies at about 1600 feet elevation and the top at about 2000 feet. The lichen flora proved to be similar qualitatively but not quantitatively to that on the summit of Mt. Marcy.

3. Newcomb. The area within or near the Archer and Anna Huntington Wild Life Forest near Newcomb, a tract operated by the New York State College of Forestry at Syracuse, New York, is representative of the greater part of the Adirondack mountain area lying at an elevation of 1600–2000 feet.

4. Warrensburg. The area on and about the Pack Demonstration Forest, a tract also operated by the New York State College of Forestry, lies at an elevation of 700–900 feet and has the mildest climate and a flora with the least boreal characteristics of the areas surveyed.

Other localities briefly visited were the vicinity of Seventh Lake, the most westerly area examined, the vicinity of the Boreas River Civilian Conservation Corps Camp near North Creek, on the slopes and summit of Mt. Colden (elevation 4700 feet), and the summit of Mt. MacIntyre (elevation 5100 feet). Some marble outcrops in the eastern part of the Adirondacks proved unsuitable due to disturbance by man, and others were not readily accessible. The extensive limestone outcrops in the north-western part have not been visited as yet, and should yield a few additional species limited to a calcicolous habitat.

The number of collections seems sufficient to provide a reasonably accurate concept of the frequency and variety of the species of *Lecidea* in the lichen flora of this region. Determinations of these collections were checked by careful comparison with reliably named herbarium specimens, that is, with specimens named by competent specialists in the genus, as Tuckerman, Willey, Fink, T. Fries, Hedlund, Magnusson and others, or with specimens in *Exsiccatae* cited by Vainio. Six species, however, were identified from the literature, as named specimens were not obtained. The descriptions were prepared from data secured from all the specimens studied. And finally the interrelations of the species were sought by a comparative study of the vegetative and fruiting structures.



To summarize the contributions to the knowledge of *Lecidea* resulting from this study, 88 species are reported, approximately tripling the number to be reasonably ascribed to the Adirondack mountain area from existing reports. Of these 88 species 5 new species and one new variety have already been described by Dr. A. H. Magnusson from these collections, and 15 additional species are described as new in this paper; 16 species are reported for the first time from North America; 8 species represent marked extensions of the known range, and 5 species are reduced to synonymy. The structure of the exciple, a tissue hitherto neglected by most lichenologists, is described and is shown frequently to possess characters decisively separating otherwise easily confused species. And finally an arrangement of the species is proposed, based upon a comparative study of the internal character of the apothecium.

The similarity of the Adirondack lichen flora to that of the Scandinavian countries is of especial interest. Most of the species described in this paper have also been reported from the Scandinavian countries, and, although there are many species reported from there that have not been found in America, the disparity is probably due more to the meagerness of the American collections than to an endemic distribution of the unduplicated species.

The distribution of the species as reported in this paper is based in part on the data accompanying the herbarium specimens which have been studied, and in part on the distribution reported by Fink<sup>2</sup> and by Zahlbruckner.<sup>3</sup>

The following species, reported by Fink<sup>2</sup> from the northeastern United States, are excluded because their identities or the records are uncertain: *L. aglaea* Sommerf., *L. aitema* Ach., *L. fuscoatra* (L.) Ach., *L. neglecta* Nyl., *L. polycarpa* Floerk., *L. russula* Ach., *L. speirea* Ach., *L. tesellina* Tuck., *L. varians* Ach., *Psora decipiens* (Ehrh.) Hoffm., *P. globifera* (Ach.) Mass., and *P. icterica* (Mont.) Müll. Arg.

In these investigations the external characters of the plants were studied with the aid of a wide field binocular microscope having a magnification of 17×; the internal characters with a binocular monobjective microscope with a magnification of 430×, using vertical sections cut by hand and mounted on glass slides. Solutions of I and 3% KOH were applied to the edge of the cover glass of mounts in distilled water and reactions were noted as they took place. All microscopic measurements were made from mounts in KOH. Permanent slides were made by mounting in 70% glycerine solution or by neutralizing KOH with lactic acid and then gradually substituting glycerine. The reaction of the thallus to KOH and I was de-

<sup>2</sup> Fink, B. The Lichen Flora of the United States. Completed for publication by Joyce Hedrick. University of Michigan Press. 1935.

<sup>3</sup> Zahlbruckner, A. *Catalogus lichenum universalis*. Vol. 1-9. 1922-1934.

terminated by immersing moderately thick sections or pieces of thallus of sufficient size in these solutions. Very thin sections or minute pieces of the thallus do not give reliable results. Tests with  $\text{CaClO}_2$ , alone or in combination with KOH, were tried but gave no results.

#### HISTORY OF THE GENUS

Lecidea (from *λέκεις*, a small cup, and *εἶδος*, in the form of) was established by Acharius<sup>4</sup> in 1803. He used characters visible to the naked eye or with moderate magnification. The thallus was described as crustose, foliose, submembranaceous, star-shaped, or rarely umbilicate, and the apothecia as round, with a proper margin but without an accessory one or rarely with a spurious accessory margin. The species admitted by Acharius are now placed in several genera in the families Lecideaceae, Umbilicariaceae, Buelliaceae, and others.

Psora was established by Haller<sup>5</sup> in 1768 for those species with a squamulose or subfoliose thallus. This genus has been recognized by some and used by others as a subgenus of Lecidea.

Biatora, established by E. Fries<sup>6</sup> in 1822, segregated those species of Lecidea that have a margin paler than the disk. The genus was limited to its present concept by T. Fries<sup>7</sup> in 1874, chiefly by removing all species with septate spores. It has been considered a valid genus by some authors, a subgenus of Lecidea by others, or dropped by still others.

Protoblastenia, a subgenus recognized by Vainio,<sup>8</sup> includes the species with crustose thallus and apothecia turning yellowish or violaceous in KOH. No species belonging to this group has been found in the Adirondacks.

In 1874 T. Fries<sup>9</sup> limited the genus as here accepted, using microscopic characters as well as macroscopic ones.

The generic characters of Lecidea intergrade with those of several other genera. Catillaria is separated on the basis of its spores being 1-septate. In some species of Lecidea the spores in part become 1-septate in age, and such species could be referred to Catillaria with equal validity. A few species, not represented in the Adirondack flora, have 12-16 spores in an ascus, a character intergrading with a diagnostic character for the genus Biatorella, which has many spores in an ascus. The genus Lecanora is usually sharply defined by the presence of an accessory thalloid margin,

<sup>4</sup> Acharius, E. Methodus Lich. 1803.

<sup>5</sup> Haller, Alberti von. Historia Stirpium indigenarum Helvetiae inchoata. Vol. III. 1768.

<sup>6</sup> Fries, E. Beskrifning på nya Lufsläkten. Vet. Akad. Handl., pp. 251-276. 1822.

<sup>7</sup> Fries, T. Lichenographia Scandinavica. I, II. 1871-1874.

<sup>8</sup> Vainio, E. A. Lichenographia Fennica IV. Lecideales II. (Completed and prepared for publication by B. Lynge.) Act. Soc. pro Fauna Flora Fenn. 57<sup>2</sup>: 1-506. 1934.

<sup>9</sup> Fries, T. Op. cit.



but in a few species this distinction is not so evident. In *Lecidea fuscescens*, for example, algal cells are frequently present in the hypothecium and the exciple. In *L. coarctata* and *L. obtegens* an imperfectly developed thalloid margin is frequently present about the base of the proper margin of the apothecium. Indeed scattered algal cells or large clumps of them may occur sporadically anywhere inside the apothecia in almost all the species. *Buellia* is separated on the basis of having 1-septate brown spores. Some species of the Phyllopsoraceae and a few species of *Cladonia*, for example *C. caespiticia* (Pers.) Floerk., closely resemble some species of *Lecidea* with squamulose thallus.

### Morphology

#### THE THALLUS

Nearly all types of crustose thalli are to be found, except perhaps umbilicate squamules. The color of the thallus is likewise variable, but is usually whitish or grayish to dark, or brown. The type of thallus produced in each species seems to be subject to relatively little variation, but the degree of development may vary greatly. This is usually the situation in those species represented by a large number of collections. The thallus of *L. steriza*, for example, may be apparently absent, membranous, verrucose, verrucose-areolate, or areolate.

The internal anatomy of the thallus naturally varies with different types of thalli. In the verrucose or areolate types, however, it is quite uniform. The upper cortical layer is composed of closely compacted hyphae or is pseudoparenchymatous, and free of algal cells which occur below the cortical tissue in a quite clearly defined layer. As the thickness of the cortex and the algal layer does not vary except within relatively narrow limits, the differences in the thickness of the thallus are due for the most part to the amount of the underlying medulla tissue produced. The medulla is usually white and is composed of loosely interwoven or less often compactly interwoven hyphae. A lower cortex is rarely and then imperfectly developed and the thallus is attached to the substratum by medullary hyphae or by the hyphae of the hypothallus.

Chemical reactions of the thallus to I or KOH solutions seem in most species to be clear-cut and specific, but tests with  $\text{CaClO}_2$  have not given any results.

The presence of species of Chlorophyceae closely associated with the fungous tissue in the thallus is a diagnostic character for the genus *Lecidea*. The algal cells are more or less globose or slightly elongated, and vary widely in size in the same thallus. The range in size appears to differ in some species, but the limits overlap a great deal. The algal cells closely resemble those of the common genus *Pleurococcus*, and according to

Vainio<sup>10</sup> are *Pleurococcus*-like or *Cystococcus*-like or, in the cephalodia, may belong to the Cyanophyceae. The occurrence of haustoria intimately connecting the fungal and algal associates in a few species, along with other characters, led Hedlund<sup>11</sup> to establish a genus *Micarea*. A few species of *Lecidea* and species from several other genera were grouped together on this basis.

The squamulose type of thallus has been considered of sufficient importance to set off a separate genus or subgenus, *Psora*. Differences in the type or color of the thallus, in its internal structure, and in the reaction to I, KOH, or  $\text{CaClO}_2$  solutions have been used to distinguish species.

The segregation of a genus or subgenus *Psora* on the basis of the occurrence of a squamulose thallus does not seem warranted. In some species usually placed under *Psora* the thallus quite frequently intergrades into the true crustose type. The anatomy of the apothecia is not at all correlated with the similarity of thalloid characters and often resembles that of certain species regularly placed in *Lecidea* more closely than that of any other species of *Psora*.

Differences in the type or color of the thallus, in its structure, and in its chemical reactions are considered in this paper valid supplementary characters when apothecial differences exist. When there are no differences in the apothecial characters, such thalloid characters are here considered of varietal rank except in a few instances, particularly when the thallus reacts positively to KOH. The presence of soredia is here considered a character of specific rank. As the thallus may vary considerably in a given species, and as it seems to be more subject to variation than apothecial characters, the thalloid characters are not considered to be applicable to the subdivision of the genus.

#### APOTHECIA

The apothecia are usually small, 0.5–1 mm. wide, with extremes in range of 0.1 and 2.5 mm. They are usually adnate to the thallus or substratum, infrequently immersed in the thallus or more or less constricted below. The disk varies in color from whitish or yellowish or more commonly darker through reddish and brownish to black, in shape from depressed to plane to strongly convex or hemispherical, smooth to minutely roughened, bare or pruinose. The margin may be well-developed, persistent or thinning and often disappearing under the expanding disk, or in a few species it is never distinguishable.

The external characters were used by Acharius<sup>12</sup> when he established

<sup>10</sup> Vainio, E. A. Op. cit.

<sup>11</sup> Hedlund, T. Kritische Bemerkungen über einige Arten der Flechtengattungen *Lecanora* (Ach.), *Lecidea* (Ach.), und *Micarea* (Fr.). Bihang K. Svenska Vet. Akad. Handl. Bd. 18, Afd. III, no. 3, pp. 1–104. 1892.

<sup>12</sup> Acharius, E. Op. cit.



the genus *Lecidea*, and they have been used since by all writers. E. Fries<sup>13</sup> established the genus *Biatora* on the basis of the paler color of the margin of the apothecia.

As the external appearance of the margin does not accurately indicate the internal anatomy of the exciple, the genus *Biatora* is not recognized in this paper. The size of the apothecia, the color of the disk, and the character of the margin are the most important and usable characters in the delimiting of species.

The apothecia are differentiated within into the hypothecium, the exciple, and the hymenium. In one species a separate tissue is present below the hypothecium forming a stipe-like base, and in several other species the exciple and hymenium have a gelatinous cover of variable thickness.

The color of the hypothecium and a carbonaceous texture have been recognized as important taxonomic characters since the introduction of microscopic study. The hypothecium is always present. The consistency of this tissue appears to be a relatively stable character, varying mostly with the age of the apothecium. A brown color is associated with consistency, as it is due to either a carbonization of the walls of the hyphae or to carbonaceous granules between the hyphae. Other colors, such as olivaceous, greenish- or bluish-black, are of infrequent occurrence. Most of the species have either a hyaline or brown hypothecium and the color, except as intensified in age, appears to be a relatively stable character.

The hyphae are usually irregularly arranged, but they may be vertically arranged in a layer of variable thickness below the hymenium, or infrequently are vertically arranged throughout. In the latter cases the hypothecium and hymenium usually intergrade, sometimes so gradually that the thickness of the hymenium can scarcely be determined. The hyphae may be closely or loosely interwoven. They may be carbonized or gelatinized, or both carbonized and gelatinized, or neither. In some saxicolous species rock particles are frequently present in the lower part of the hypothecium. The hyphae may be incrustated with granular matter. A marked reaction to KOH, except a clearing action, is unusual. Likewise there is usually no reaction to I solution.

In a few species algal cells occur in the hypothecium with considerable frequency, and in all species clumps of algal cells occur sporadically, and may extend into the hymenium or exciple as well.

The exciple has been used to a limited extent in the taxonomy of the genus. T. Fries<sup>14</sup> described its color and rarely its extent. Hedlund<sup>15</sup> and Vainio<sup>16</sup> describe it in considerable detail. Hedlund<sup>15</sup> and Lynge<sup>17</sup> state

<sup>13</sup> Fries, E. Op. cit.

<sup>14</sup> Fries, T. Op. cit.

<sup>15</sup> Hedlund, T. Op. cit.

<sup>16</sup> Vainio, E. A. Op. cit.

<sup>17</sup> Lynge, B., in Vainio, E. A. Op. cit.

that it may provide valuable characters for the subdivision of the genus, yet only Hedlund<sup>15</sup> has used it for this purpose.

The exciple is frequently an extensive tissue, with characters as marked as those of the hypothecium, with which it is intimately connected. It is often more or less continuous with the hypothecium, or sometimes quite dissimilar in color and consistency. The remarks on the characters of value in the hypothecium apply equally well to the exciple. The arrangement of the hyphae is, however, of greater significance. In a relatively small number of species the hyphae are irregularly arranged, Fig. 1, A; in most species

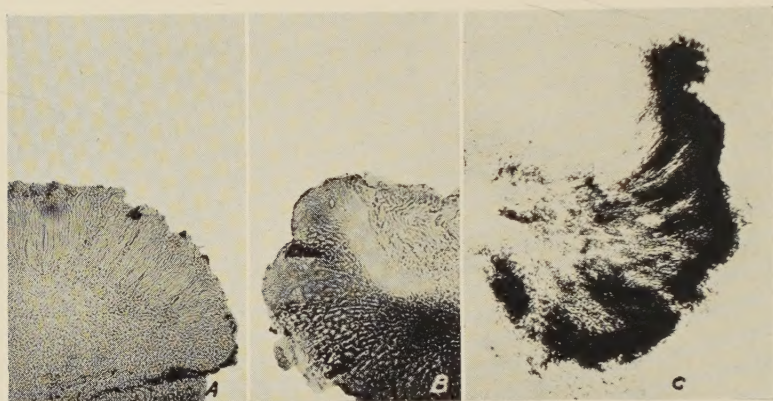


FIG. 1. Structural types in the exciple of *Lecidea*. A, hyphae irregularly arranged (from *Lecidea granulosa*, n. 3216); B, hyphae radially arranged and diverging (from *L. steriza*, n. 5881); C, hyphae radially arranged and parallel (from *L. cinereotatra*, n. 3949—of an old apothecium with thickened exciple). All  $\times 150$ .

however they are radially arranged. In the latter group two subtypes can be recognized, one in which the hyphae are slender, running more or less parallel to the edge of the hypothecium and the side of the hymenium and diverging but slightly, Fig. 1, C, another in which the hyphae diverge decidedly and are often quite wide, Fig. 1, B. The exciple appears to offer more useful characters for the subdivision of the genus than the hypothecium, except for such species as *L. sylvicola*, in which the poor development or absence of the exciple is probably a simplification of the apothecial structure rather than a primitive condition. In these species the structure of the exciple can usually be ascertained if abundant collections are available for examination, and it has been found to be the radially arranged type.

The hymenial characters have been used since the application of microscopic distinctions in the taxonomy of the genus. The hymenium is generally  $50-80\mu$  thick. It is sometimes covered with a variable amount of granular matter, which may give a characteristic color to the upper part of



the hymenium, or the color may be in the walls of the paraphyses at their apices. The middle and lower part of the hymenium is usually hyaline or pale. In most species the hymenium contains a variable amount of gelatinous matter, a feature that distinguishes the lichens from most of the non-algicolous discomycetes.

The paraphyses in a few species are filiform or hyphoid. In most species, however, they are of characteristic shape, strictly vertically arranged, and rarely branched. The degree of coherence depends on the nature of the gelatinous matrix, and is often variable in the same species.

The asci are usually clavate, but in a few species they are elongated and cylindrical. The size and shape of the spores differ considerably, but are very distinctive characters for each species.

#### CONIDANGIA

The conidangia, also called pycnidia or pycnoconidangia, and their spores were used by T. Fries<sup>18</sup> to aid in the separation of some closely related sections in the genus. The conidangia occur infrequently and have not been discovered yet in many of the rarer species. Conidangia were found so seldom in the specimens examined in these studies that all mention of these structures has been omitted.

#### Criteria for the Subdivision of the Genus

From my studies the anatomy of the apothecia appears to offer the most reliable characters for the natural arrangement of species within the genus. The hypothecium and the exciple are the two most significant tissues and their consistency, color, arrangement of the hyphae and the degree of intergradation or differentiation of these two tissues appear to offer the most useful characters for subdivision of the genus. The height of the hymenium may serve to supplement other characters in segregating small groups of species. Others, such as the nature and coherence of the paraphyses, the size and shape of the spores, the presence or absence of granular inclusions, chemical reactions, etc., appear to be of specific value rather than of sectional or group value.

#### Acknowledgments

Encouragement and direction of this study, as well as the extension of the facilities of the Herbarium of the University of Michigan, were given by Dr. E. B. Mains, to whom I tender my sincere thanks. Dr. D. L. Linder of the Farlow Reference Library and Cryptogamic Herbarium at Harvard University, Dr. W. R. Maxon at the National Herbarium at Washington, D. C., and Dr. F. W. Pennell at the Philadelphia Academy of Natural Sciences, Philadelphia, Pa., lent specimens of lichens under their care. Dr. A. H. Magnusson, of Göteborg, Sweden, has constantly encouraged me and has given aid freely in the determination or confirmation of many specimens submitted to him. I am indebted for encouragement and material aid to the administrative officers of the New York State College of Forestry and especially to Dr. H. F. A. Meier, Head of the Department of Forest Botany and Pathology. And I am indebted to Mr. H. W. Hicks of the Lake Placid Club for many courtesies extended during the collecting trips on or about Mt. Marcy.

<sup>18</sup> Fries, T. Op. cit.

**Lecidea** (Ach.) T. Fries, Lich. Scand. II, p. 410. 1874.

*Lecidea* Ach., Meth. Lich., p. 32. 1803 (emend.).

*Psora* Hall., Hist. Stirp. Helv. III, p. 93. 1768 (p.p.).

*Biatorea* E. Fries, Vet. Akad. Handl., p. 263. 1822 (p.p.).

Thallus crustose, powdery, granulose, or continuous, membranous, rimose, areolate, or verrucose, uniform or with a more or less definite margin, or squamulose to subfoliaceous, sometimes sorediate, fastened to the substratum by the hyphae of the hypothallus or of the medulla, ecorticate or imperfectly corticate, at least below; associated algae one-celled, belonging to the Chlorophyceae or, in the rare cephalodia, belonging, according to Vainio, to the Cyanophyceae.

Apothecia round or more or less angular by mutual pressure, adnate or immersed or more or less constricted below, small, the disk depressed or plane or convex to hemispherical, pale or dark, bare or rarely pruinose, with a concolorous or paler or rarely darkened margin. Hypothecium hyaline or pale, or brown or blackish, often gelatinous or carbonaceous. Exciple without an accessory thalloid margin or rarely with a poorly developed one about the base of the exciple, continuous with or more or less distinct from the hypothecium, hyaline or more or less colored, usually brown or blackish, often gelatinous or carbonaceous. Hymenium usually sharply delimited from the hypothecium, sometimes intergrading with it, with more or less gelatinous matter which usually softens or rarely dissolves in KOH, the paraphyses simple or branched, slender, the apices frequently somewhat enlarged. Asci clavate or rarely cylindrical. Spores hyaline, non-septate or in age rarely in part 1-septate or very rarely up to 3-septate, 8 in an ascus or very rarely 12-16, oblong or ellipsoid or broadly ellipsoid to more or less globose, middle-sized or small, usually with thin walls.

## KEY TO THE SPECIES

## I. Plants on rocks

(For plants on wood or bark, see p. 237; for plants on soil or moss, see p. 238)

- 1a. Thallus with pink cephalodia.....23. *L. panaeola*
- 1b. Thallus without pink cephalodia
  - 2a. Hypothecium dark, brown or black
    - 3a. Spores large, 11-24×5-11μ; hymenium usually 90μ or more thick (see also 25. *L. Dicksonii*, 27. *L. columnata*, and 35. *L. nemoralis*)
    - 4a. Excipular hyphae conglutinate, at least at first, strongly divergent, 4-12μ in diameter
      - 5a. Hypothecium conglutinate; hymenium bluish-black above; spores ellipsoid to broadly ellipsoid.....48. *L. latypea*
      - 5b. Hypothecium usually soon carbonaceous; spores oblong to ellipsoid, rarely broader
      - 6a. Exciple maroon-red in KOH.....21. *L. phylliscina*
      - 6b. Exciple not reacting or darkening slightly in KOH
        - 7a. Hypothecium olivaceous-black or bluish-black.....24. *L. diversa*
        - 7b. Hypothecium some shade of brown
          - 8a. Hymenium 80-90μ thick; apothecia 0.3-0.8 mm. wide.....22. *L. crustulata*
          - 8b. Hymenium 80-120μ thick; apothecia 0.5-2 mm. wide



- 9a. Thallus not sorediate . . . . . 19. *L. steriza*  
 9b. Thallus white-punctate with inconspicuous soredia . . . . . 20. *L. soredifera*
- 4b. Excipular hyphae carbonized or immersed in a gelatin matrix, not strongly divergent, 2-5 $\mu$  in diameter
- 5a. Exciple very soon dark and carbonaceous; apothecia 0.4-0.7 mm. wide . . . . . 26. *L. cinereoatra*  
 5b. Exciple very slowly carbonizing; apothecia 0.5-2.5 mm. wide
- 6a. Thallus with inconspicuous soredia . . . . . 29. *L. sorediza*  
 6b. Thallus without soredia . . . . . 28. *L. albocaerulescens*
- 3b. Spores smaller, rarely over 15 $\mu$  long or 6 $\mu$  wide, if wider, then rarely over 14 $\mu$  long; hymenium usually less than 90 $\mu$  thick
- 4a. Hymenium more or less greenish-black or olivaceous-black above or in the lower part
- 5a. Hymenium 9 $\mu$  or more thick
- 6a. Spores subglobose to globose, 7-9 $\mu$  in diam.; thallus brown, squamulose . . . . . 49. *L. cinereorufa*  
 6b. Spores oblong to broadly ellipsoid, 11-14 $\times$ 5-8 $\mu$
- 7a. Thallus medulla I blue; hymenium 100 $\mu$  thick . . . . . 55. *L. lapicida*  
 7b. Thallus medulla I-; hymenium 90-130 $\mu$  thick . . . . . 50. *L. atrocinerea*
- 5b. Hymenium 25-80 $\mu$  thick, rarely thicker
- 6a. Apothecia usually over 0.5 mm. wide
- 7a. Spores 3-4 $\mu$  wide; thallus usually pale . . . . . 52. *L. auriculata*  
 7b. Spores 4-6 $\mu$  wide; thallus dark
- 8a. Thallus distinctly brown; spores oblong-ellipsoid to ellipsoid . . . . . 45. *L. brunneofusca*  
 8b. Thallus black or grayish-black; spores ellipsoid to broadly ellipsoid . . . . . 46. *L. furva*
- 6b. Apothecia usually less than 0.5 mm. wide
- 7a. Spores 8-14 $\times$ 4-8 $\mu$
- 8a. Thallus reddish; spores 5-8 $\mu$  wide . . . . . 25. *L. Dicksonii*  
 8b. Thallus rarely reddish; spores 4-6 $\mu$  wide
- 9a. Exciple brown throughout . . . . . 41. *L. pycnocarpa*  
 9b. Exciple greenish-black above
- 10a. Apothecia solitary; 0.3-0.6 mm. wide . . . . . 43. *L. humilis*  
 10b. Apothecia usually densely conglomerate, 0.15-0.3 mm. wide . . . . . 42. *L. marciensis*
- 7b. Spores 4-9 $\times$ 1.5-3.5 $\mu$
- 8a. Hypothecium greenish-black, at least above
- 9a. Thallus granular; spores 4-5 $\times$ 1.5-2 $\mu$  . . . . . 77. *L. adirondackii*  
 9b. Thallus verrucose or scurfy, rarely granular; spores 5-9 $\times$ 2.5-3.5 $\mu$
- 10a. Apothecia marginate; spores 5-6 $\times$ 2.5 $\mu$  . . . . . 58. *L. atomaria*  
 10b. Apothecia immarginate; spores 6.5-8 $\times$ 3-3.5 $\mu$  . . . . . 57. *L. sylvicola*
- 8b. Hypothecium reddish- or yellowish-brown throughout
- 9a. Thallus reddish-orange; hypothecium yellowish-brown; exciple not developed . . . . . 56. *L. amniculensis*  
 9b. Thallus brownish or greenish; hypothecium reddish-brown or darker; exciple usually well-developed
- 10a. Thallus of brownish or grayish-green verrucae, or membranous . . . . . 53. *L. erratica*  
 10b. Thallus yellowish-green (whitish in herbaria), granulose . . . . . 54. *L. suberratica*
- 4b. Hymenium above brown or paler to hyaline
- 5a. Hypothecium bluish or greenish-black, not brown
- 6a. Spores 8-9.5 $\times$ 3-4 $\mu$  . . . . . 62. *L. lynceola*  
 6b. Spores 12-16 $\times$ 5-8 $\mu$  . . . . . 35. *L. nemoralis*
- 5b. Hypothecium and exciple some shade of brown
- 6a. Spores 6-8 $\times$ 2.5-3.5 $\mu$  . . . . . 38. *L. cyrtidea*  
 6b. Spores 8-14 $\times$ 3.5-7 $\mu$

- 7a. Spores oblong or subfusiform to ellipsoid
  - 8a. Spores 3.5–5 $\mu$  wide; exciple not appearing pseudoparenchymatous. . . . . 36. *L. virginiensis*
  - 8b. Spores 5–6 $\mu$  wide; exciple appearing pseudoparenchymatous in vertical section. . . . . 34. *L. delincta*
- 7b. Spores ellipsoid to broadly ellipsoid or subglobose
  - 8a. Apothecial margin thin; spores 8–9 $\times$ 5–5.5 $\mu$ , or 5–6 $\mu$  in diameter. . . . . 14. *L. fuscocinerea*
  - 8b. Apothecial margin thick, persistent, frequently fissured; spores 11–12 $\times$ 5–7 $\mu$  . . . . . 27. *L. columnata*
- 2b. Hypothecium pale to hyaline, at least below
  - 3a. Hymenium olivaceous-green to greenish- or bluish-black above, at least near the margin
  - 4a. Spores, in part at least, broadly ellipsoid to subglobose, 5 $\mu$  or more wide; paraphyses readily separable in KOH
    - 5a. Thallus squamulose, grayish-brown. . . . . 60. *L. rugosa*
    - 5b. Thallus verrucose or areolate-verrucose or thin to lacking
      - 6a. Apothecia remaining immersed for the greater part; hymenium 90–130 $\mu$  thick . . . . . 50. *L. atrocinerea*
    - 6b. Apothecia superficial; hymenium rarely over 100 $\mu$  thick
      - 7a. Spores 6–11 $\mu$  wide
        - 8a. Exciple hyphae 2–3 $\mu$  in diameter, imbedded in jelly. . . . . 69. *L. stigmathea*
        - 8b. Exciple hyphae 4–8 $\mu$  in diameter, conglutinate. . . . . 70. *L. goniophila*
      - 7b. Spores 5–7 $\mu$  wide
        - 8a. Hymenium 50 $\mu$  thick; exciple hyphae 5 $\mu$  in diameter. . . . . 72. *L. placidensis*
        - 8b. Hymenium 60–100 $\mu$  thick; exciple hyphae 3–10 $\mu$  in diameter. . . . . 71. *L. granulata*
  - 4b. Spores oblong to ellipsoid, rarely broadly ellipsoid, not over 5 $\mu$  wide
    - 5a. Apothecia rarely over 0.5 mm. wide; hypothecium tending to greenish-black or olivaceous-black
      - 6a. Spores 5–6 $\times$ 2.5 $\mu$ . . . . . 58. *L. atomaria*
      - 6b. Spores 8–12 $\times$ 2.5–4 $\mu$ . . . . . 59. *L. conferenda*
    - 5b. Apothecia usually over 0.5 mm. wide; hypothecium hyaline
      - 6a. Thallus squamulose, olivaceous-brown or the margin greenish-black. . . . . 61. *L. rufonigra*
      - 6b. Thallus crustose, gray. . . . . 65. *L. enteromorpha*
- 3b. Hymenium brown or reddish to pale and hyaline above, not greenish-black
  - 4a. Apothecia 0.2–0.5 mm. wide
    - 5a. Apothecia more or less yellow. . . . . 78. *L. lucida*
    - 5b. Apothecia black
      - 6a. Spores 6–9 $\times$ 3 $\mu$ . . . . . 62. *L. lynceola*
      - 6b. Spores 4–5 $\times$ 1.5–2 $\mu$ . . . . . 77. *L. adirondackii*
  - 4b. Apothecia 0.5 mm. or more wide
    - 5a. Spores large, 10–21 $\times$ 6–13 $\mu$ ; apothecia often with several concentric margins
      - 6a. Thallus with whitish soredia. . . . . 11. *L. oblegens*
      - 6b. Thallus not sorediate. . . . . 10. *L. coarctata*
    - 5b. Spores smaller, 8–13 $\times$ 3.5–7 $\mu$ 
      - 6a. Thallus squamulose, white-marginate. . . . . 73. *L. Russellii*
      - 6b. Thallus crustose, membranous or verrucose or areolate
        - 7a. Thallus sorediate. . . . . 16. *L. praeruptorum*
        - 7b. Thallus not sorediate
          - 8a. Paraphyses coherent; spores slender, 3.5–4 $\mu$  wide. . . . . 64. *L. lithophila*
          - 8b. Paraphyses easily separable in KOH; spores usually wider
            - 9a. Spores somewhat curved, more or less reniform. . . . . 15. *L. arcuatula*
            - 9b. Spores straight, not reniform
              - 10a. Thallus in KOH with a yellowish or yellowish-orange stain and finally forming acicular ruby-red crystals. . . . . 74. *L. Arnoldii*



- 10b. Thallus not reacting with KOH or at the most forming a yellow stain  
 11a. Thallus medulla blue with I. .... 17. *L. Lowensis*  
 11b. Thallus medulla not reacting to I. .... 18. *L. Kochiana*

II. Plants on decorticate wood or bark

(For plants on rock, see p. 234; for plants on soil or moss, see p. 238)

- 1a. Hypothecium moderately brown to dark brown (see also 86. *L. hypopta*)  
 2a. Hymenium greenish-black above  
 3a. Thallus squamulose with ascending margins, often sorediate below. .... 51. *L. scalaris*  
 3b. Thallus crustose  
 4a. Apothecia 0.2-0.5 mm. wide; spores  $6-9 \times 2.5-3.5\mu$ . .... 53. *L. erratica*  
 4b. Apothecia 0.3-1 mm. wide; spores  $11-16 \times 7-9\mu$ . .... 47. *L. euphorea*  
 2b. Hymenium brown or pale above  
 3a. Hymenium 80-100 $\mu$  thick; spores  $5-7\mu$  wide. .... 12. *L. uliginosa*  
 3b. Hymenium not over 60 $\mu$  thick; spores not over  $5\mu$  wide  
 4a. Thallus well-developed, distinctly brown; plants usually on charred wood  
 5a. Apothecia often clustered; spores  $7-12 \times 2.5-4.5\mu$ ; thallus sometimes sorediate. .... 40. *L. botryosa*  
 5b. Apothecia solitary; spores  $7-9 \times 3-4\mu$ ; thallus not sorediate. .... 13. *L. Friesii*  
 4b. Thallus usually very thin to lacking, when present usually white or grayish-white; on decorticate wood and bark  
 5a. Spores  $8-13 \times 3-5\mu$ ; thallus white or greenish-white. .... 33. *L. albofuscescens*  
 5b. Spores  $6-9 \times 2.5-4\mu$ ; thallus usually absent  
 6a. Hypothecium moderately pale brown, in the upper part staining olivaceous in KOH. .... 39. *L. plebeja*  
 6b. Hypothecium usually dark brown, KOH- or slightly darker  
 7a. Exciple usually dark externally; hypothecial hyphae carbonaceous. .... 38. *L. cyrtidea*  
 7b. Exciple paler externally; hypothecial hyphae conglutinate-carbonaceous. .... 37. *L. myriocarpoides*  
 1b. Hypothecium hyaline or pale  
 2a. Spores broadly ellipsoid to globose  
 3a. Spores large,  $16-21 \times 11-14\mu$ . .... 63. *L. tornoënsis*  
 3b. Spores much smaller  
 4a. Exciple in KOH externally pseudoparenchymatous. .... 9. *L. pulla*  
 4b. Exciple homogeneous throughout, of radially arranged hyphae  
 5a. Thallus verruculose; excipular hyphae  $5-11\mu$  in diameter. .... 76. *L. fuscescens*  
 5b. Thallus granulose; excipular hyphae  $2.5-5\mu$  in diameter. .... 75. *L. Nylanderi*  
 2b. Spores oblong to ellipsoid or narrowly clavate  
 3a. Apothecia usually black  
 4a. Apothecia 0.1-0.25 mm. wide; spores  $5-7\mu$  long. .... 67. *L. punctella*  
 4b. Apothecia 0.2-1 mm. wide; spores usually longer than  $7\mu$   
 5a. Thallus granulose, on very rotten wood. .... 2. *L. viridescens*  
 5b. Thallus very rarely granulose; on sound wood or bark  
 6a. Spores  $5-6\mu$  wide. .... 8. *L. caeca*  
 6b. Spores not over  $5\mu$  wide  
 7a. Spores  $7-9\mu$  long; thallus sometimes sorediate. .... 4. *L. flexuosa*  
 7b. Spores often over  $9\mu$  long; thallus not sorediate  
 8a. Thallus lacking or nearly so; apothecia 0.2-0.5 mm. wide. .... 68. *L. turgidula*  
 8b. Thallus usually present and well-developed; apothecia 0.3-1 mm. wide. .... 5. *L. melancheima*  
 3b. Apothecia darkening in age but rarely becoming black  
 4a. Hymenium more or less greenish-black above in KOH  
 5a. Hypothecium and exciple more or less pseudoparenchymatous; spores  $8.5-11 \times 2.5\mu$ . .... 81. *L. cellularis*  
 5b. Hypothecium and exciple plectenchymatous; spores  $13-15.5 \times 4.5-5\mu$ . .... 83. *L. caesiocoronata*

- 4b. Hymenium brown or colorless above in KOH
  - 5a. Hymenium 25-40 $\mu$  thick
    - 6a. Thallus granulose or verrucose; apothecia some shade of yellow. . . . . 78. *L. lucida*
    - 6b. Thallus squamulose; apothecia reddish-brown. . . . . 66. *L. cladonioides*
  - 5b. Hymenium 40-85 $\mu$  thick
    - 6a. Thallus frequently sorediate; excipular hyphae irregularly arranged. . . . . 1. *L. granulosa*
    - 6b. Thallus not sorediate; excipular hyphae radially arranged
      - 7a. Excipular hyphae with thin walls, immersed in a gelatinous matrix
        - 8a. Spores 12-19 $\times$ 3-7 $\mu$ . . . . . 88. *L. vernalis*
        - 8b. Spores 7-13 $\times$ 3-5 $\mu$ 
          - 9a. Thallus present; hypothecial hyphae 4-7 $\mu$  in diameter. . . . . 84. *L. cadubriana*
          - 9b. Thallus absent; hypothecial hyphae 2-3 $\mu$  in diameter. . . . . 85. *L. carnulenta*
      - 7b. Excipular hyphae with thick, gelatinized walls
        - 8a. Thallus fibrous or minutely granulose or verruculose; spores 9-14 (16) $\mu$  long. . . . . 87. *L. erythrophaea*
        - 8b. Thallus absent or thin, membranous, smooth to areolate or subverruculose; spores 8-11 $\mu$  long. . . . . 86. *L. hypopta*

### III. On soil and moss

(For plants on rock, see p. 234; for plants on wood and bark, see p. 237)

- 1a. Spores 15-24 $\times$ 5.5-8 $\mu$ . . . . . 79. *L. caesiocatra*
- 1b. Spores smaller
  - 2a. Hypothecium dark
    - 3a. Hymenium 40-60 $\mu$  thick; apothecia gradually constricted below to form a short stout stipe. . . . . 44. *L. crassipes*
    - 3b. Hymenium 60 $\mu$  or more thick; apothecia adnate or constricted below but without a stipe
      - 4a. Exciple pseudoparenchymatous externally; thallus usually brown. . . . . 12. *L. uliginosa*
      - 4b. Exciple of radially arranged hyphae; thallus usually greenish-gray to white
        - 5a. On Diapensia. . . . . 32. *L. Diapensiae*
        - 5b. On soil or over moss
          - 6a. Exciple of slender hyphae with inconspicuous lumina; thallus usually poorly developed. . . . . 31. *L. fusca*
          - 6b. Exciple of coarse hyphae with numerous cross walls, appearing pseudoparenchymatous in vertical sections; thallus usually rather thick. . . . . 30. *L. Berengeriana*
  - 2b. Hypothecium pale to hyaline
    - 3a. Hymenium brown or colorless above
      - 4a. Thallus crustlike, of closely adnate squamules, usually brown. . . . . 6. *L. demissa*
    - 4b. Thallus membranous, granulose or varying to verrucose, usually gray or grayish-green
      - 5a. Thallus minutely granulose. . . . . 2. *L. viridescens*
      - 5b. Thallus verruculose to verrucose or membranous
        - 6a. Spores 12-19 (21) $\times$ 3-7 $\mu$ ; excipular hyphae radially arranged. . . . . 88. *L. vernalis*
        - 6b. Spores 9-14 $\times$ 4-6 $\mu$ ; excipular hyphae irregularly arranged or pseudoparenchymatous externally
          - 7a. Exciple externally strongly tending to form a pseudoparenchymatous tissue; thallus membranous to subverruculose. . . . . 7. *L. gelatinosa*
          - 7b. Exciple of irregularly arranged hyphae throughout or externally of hyphae arranged briefly parallel to form a poorly distinct cortical tissue; thallus verrucose. . . . . 1. *L. granulosa*
  - 3b. Hymenium bluish- or greenish-black above or throughout
    - 4a. Spores 5-6 $\mu$  wide. . . . . 3. *L. sphacelata*
  - 4b. Spores 3-5 $\mu$  wide
    - 5a. Thallus of coarse, subglobose or elongated verrucules; spores 7-10 $\mu$  long. . . . . 80. *L. subramosa*
    - 5b. Thallus membranous to minutely verruculose; spores 10-13 $\mu$  long. . . . . 82. *L. limosa*



### Arrangement and Description of the Species

- 1a. Excipular hyphae usually neither gelatinized nor embedded in a gelatinous matrix, often interwoven
- 2a. Paraphyses usually hyphoid, slender or slightly enlarged above
- 3a. Hypothecium hyaline or pale
- 4a. Apothecia neither provided with a veil over the disk nor proliferating; spores not over  $16\mu$  long
- 5a. Exciple tissue plectenchymatous throughout

#### 1. LECIDEA GRANULOSA (Ehrht.) Ach., Meth. Lich., p. 65. 1803.

*Lichen granulatus* Ehrht., Plant. Crypt., Exs., n. 145. 1785 (in part at least, according to Vainio).

Thallus thin to moderately thick, verrucose or areolate-verrucose, grayish-white to grayish-green or dark olivaceous-brown, the verrucules 0.1–0.4 mm. wide, compacted or sometimes scattered, frequently breaking up to form greenish- or grayish-white soredia, KOH– or with a yellow stain, I–. Apothecia 0.5–1.5 mm. wide, adnate, the disk plane to moderately or strongly convex, usually some shade of olivaceous at first, becoming yellowish-brown to brown-black and black, or pinkish, or reddish, bare, the margin at first thick, becoming thinner and sometimes disappearing, whitish to pale or dark olivaceous. Hypothecium nearly hyaline to pale olivaceous, in KOH granular matter, if present, dissolving at once and the tissue hyaline, the hyphae usually  $2-5\mu$  in diameter, but sometimes inflated and up to  $13\mu$ , the walls of variable thickness. Exciple continuous with or distinct from the hypothecium, within pale olivaceous and usually with granular matter, externally darker, in KOH hyaline or pale brownish within and the granular matter dissolving at once, externally olivaceous- or reddish-brown, the hyphae  $3-5\mu$  in diameter, mostly irregularly arranged, with wide lumina and numerous cross-walls, the cells often with conspicuous oil globules. Hymenium brown above, nearly hyaline to pale brown below, in KOH usually at first with a distinct reddish tinge and often becoming nearly hyaline above,  $60-80\mu$  thick, more or less continuous with the hypothecium, the paraphyses hyphoid, fragmenting in water, readily separating in KOH, usually several times branched to somewhat net-branched,  $1-2\mu$  in diameter. Spores hyaline, non-septate, oblong with rounded ends or ellipsoid,  $9-13 \times 4-6\mu$ .

On sandy or peaty soil, decorticate wood, and bark, Chapel Pond, 1523; Mt. Marcy, 2736, 3136, 3216, 3310, 3302; Marcy Brook, 2652, 2654, 2988, 2993; Newcomb, 4679, 4977, 6026, 6029, 6065; Warrensburg, 5421, 5636, 5910; reported from both hemispheres, especially in the temperate regions. The forms, which have been based upon the very variable color of the disk, seem scarcely worthy of distinction.

2. *LECIDEA VIRIDESCENS* (Schrad.) Ach., Meth. Lich., p. 62, 1803.

*Lichen viridescens* Schrad., Spic. Fl. Germ., p. 88, 1794.

Thallus of variable thickness, greenish-gray, minutely granulose, the granules 0.05–0.15 mm. in diameter, in part breaking up to form soredia, I–, KOH– or with a yellow-brown stain. Apothecia frequently conglomerate, when solitary 0.3–0.7 mm. wide, adnate or sometimes constricted below, convex from the first, black, bare, often granular, the margin indistinct. Hypothecium some shade of olive color, the hyphae 2–4 $\mu$  in diameter, with thin to thick walls, vertically arranged above or sometimes nearly throughout. Exciple continuous with the hypothecium, moderately dark olivaceous-green or brown externally, in KOH the granular matter dissolving and usually changing to some shade of red externally, the hyphae radially arranged, otherwise as in the hypothecium. Hymenium more or less olivaceous, darker above, in KOH with distinct reddish-brown color above, 65–80 $\mu$  thick, the paraphyses hyphoid, separable to rather coherent, in KOH readily separable, somewhat branched, 1.5–2 $\mu$  in diameter. Spores hyaline, non-septate, oblong with rounded ends or ellipsoid, 9–13  $\times$  3.5–5 $\mu$ .

On rotten wood, Newcomb, 3856, 3955, 4592, 4596, 4846; Seventh Lake, 4470; Warrensburg, 3608, 3611, 5131, 5789, 5921; reported from the Northern Hemisphere.

3. *LECIDEA SPHACELATA* T. Fries, Lich. Scand. II, p. 445. 1874.

Thallus moderately thick, verrucose, the verrucules contiguous, convex, 0.2–0.5 mm. wide, or more or less fused and compacted and cracking to become areolate-rimose, whitish or sordid grayish-white, I–, KOH with a distinct orange-red stain and finally forming slender orange-red crystals. Apothecia 0.3–0.7 mm. wide, solitary or often contiguous and angular, adnate to moderately constricted below, the disk depressed or becoming plane, the margin at first thick, elevated, becoming thinner but usually persisting. Hypothecium nearly hyaline to pale olivaceous-green or olivaceous-brownish, the hyphae 1.5–2 $\mu$  in diameter, with thick walls, indistinctly vertically arranged. Exciple more or less continuous with the hypothecium, externally dark from much imbedded brown-black granular matter, within with a rather narrow olivaceous-green layer, KOH distinctly purple-brown within, of interwoven hyphae, 1.5–2 $\mu$  in diameter, the hyphal tips in the upper part slightly colored, scarcely enlarged, in the lower part 3–5.5 $\mu$  in diameter, with dark brown walls. Hymenium with much brown-black coarsely granular matter above, pallid to olivaceous-greenish or distinctly pale greenish-black below, KOH paler or brighter, the granular material dissolving, 70–90 $\mu$  thick, the paraphyses more or less hyphoid, coherent, easily separable in KOH, usually 1–3 times branched in the upper half, about 1.5 $\mu$  in diameter or above very



slightly enlarged. Spores hyaline, non-septate, ellipsoid to broadly ellipsoid,  $11-12 \times 5-6\mu$ .

On soil, Mt. Marcy, 4190; reported elsewhere from the Scandinavian countries. The determination was made from Fries' description, although there are discrepancies. Fries described the thallus as not reacting to KOH and the apothecia as sessile or subturbinate. The thallus, apothecia, and color of the epithecium differ markedly from that of *L. granulosa*, the most closely related species.

4. *LECIDEA FLEXUOSA* (E. Fries) Nyl., Act. Soc. Linn. Burd. 21: 356. 1857.

*Biatora flexuosa* E. Fries, Vet. Akad. Handl., p. 268, 1822.

Thallus thin or moderately thin, grayish-green to olivaceous-brown; verruculose or rarely granulose, the verrucules dispersed to contiguous and fused, 0.1-0.3 mm. wide, usually non-sorediate, sometimes breaking up to form scattered yellowish-green soredia or rarely sorediate almost throughout, I-, KOH- or with a slight yellowish-brown stain. Apothecia 0.3-0.6 (0.8) mm. wide, adnate, the disk depressed or becoming plane, black, bare, the margin thick, at first elevated and usually remaining so, olivaceous or darker to black, sometimes becoming flexuous. Hypothecium hyaline to pale pinkish-brown, in KOH hyaline, the hyphae 1.5-2.5 $\mu$  in diameter, with moderately thin walls, vertically arranged in an upper layer about 20-40 $\mu$  thick, below usually with many minute oil globules. Exciple dark brown or olivaceous-brown externally, more or less olivaceous within, usually with abundant granular matter dissolving at once in KOH, often with a distinct reddish tint, the hyphae 4-7 $\mu$  in diameter, with thin walls, indistinctly radially arranged, with prominent oil globules except in a narrow external part where the walls are moderately brown in color. Hymenium dark olivaceous-brown or brown above, pale olivaceous-brownish or greenish to hyaline below, in KOH usually with a strong reddish tint, 40-55 $\mu$  thick, the paraphyses fragmenting in water, readily separating in KOH, hyphoid, constricted at the septa, 1.5-2.5 $\mu$  in diameter. Spores hyaline, non-septate, oblong-ellipsoid to ellipsoid,  $7-9 \times 2.5-4$  (4.5) $\mu$ .

On decorticate or charred wood, rarely on bark, Chapel Pond, 3768, 5484, 5564; Marcy Brook, 6402; Newcomb, 6012, 6014, 6024; and Warrensburg, 5400, 5696, 5703, 5763, 5764, 5874; reported from North America and Europe.

5. *LECIDEA MELANCHEIMA* Tuck., Proc. Amer. Acad. Arts and Sci. 1: 260. 1848.

*Lecidea elabens* E. Fries, Vet. Akad. Handl., p. 256. 1822.

Thallus varying from poorly developed and subimmersed in the substratum to moderately thick, whitish or grayish, verrucose, the verrucules crowded and often more or less confluent, usually becoming discrete,

0.2–0.7 mm. wide, in KOH usually giving a yellow stain, I–. Apothecia 0.3–1 mm. wide, at first immersed in the thallus but soon emerging and becoming adnate, the disk plane to moderately convex or rarely strongly convex, black, often glossy, the margin usually thin and inconspicuous, often disappearing. Hypothecium hyaline to pale brownish or pale yellowish-brown, the hyphae usually vertically arranged in an upper layer 80–160 $\mu$  thick, often more or less granular-appearing, sometimes somewhat conglutinate, the vertical hyphae 3–4 $\mu$  in diameter with moderately thick to quite thick walls, often mixed with much branched, irregular, sometimes nodose, thin- to thick-walled hyphae 3–6 $\mu$  in diameter. Exciple continuous with the hypothecium or distinctly delimited, hyaline to brownish or yellowish-brown within, dark reddish-brown to dark brown or brown-black externally, the hyphae 3–5 $\mu$  in diameter, with walls of variable thickness, radially arranged, often somewhat incrustated with granular matter, sometimes somewhat conglutinate, at the apices usually darkened, more or less carbonized, and enlarged up to 5 $\mu$ . Hymenium usually covered with a thick (up to 30 $\mu$ ) gelatinous layer, dark olivaceous- to reddish-brown or brown-black above, hyaline or pale brownish below, in KOH usually pale to moderately dark olive above, 45–70 $\mu$  thick, the paraphyses coherent, quite easily separable or moderately coherent in KOH. 1.5–2.5 $\mu$  in diameter, or brownish and enlarged to 4 $\mu$  above. Spores hyaline, non-septate, narrowly ellipsoid to ellipsoid, 8–10 (12)  $\times$  3–4 $\mu$ .

On decorticate wood, rarely on bark, Chapel Pond, 5535; Newcomb, 4048, 4858, 4859, 6041; and Warrensburg, 3561, 5873, 5950; widely distributed in North America and in Europe. The current European concept of *L. elabens* as indicated by numerous specimens named by competent lichenologists is the same as that of *L. melancheima* of Tuckerman. The identity of the original specimen of *L. elabens* seems to be in some question, as Tuckerman (Synop. N. Amer. Lich. II, p. 82) states that Fries' plant is a poorly developed specimen of *L. Friesii*; T. Fries (Lich. Scand. II, p. 554) places Tuckerman's species in synonymy with *L. elabens*; and Zahlbruckner (Cat. Lich. Univ. III, p. 888) places the latter in synonymy with *L. ostreata* v. *myrmecina* (Ach.) Nyl.

#### 6. LECIDEA DEMISSA (Rutstr.) Ach., Meth. Lich., p. 81. 1803.

*Lichen demissus* Rutstr., Diss. Pl. Crypt., p. 8. 1794 (according to Vainio).

*Psora demissa* (Rutstr.) Almq., Öfv. Kongl. Vetens.-Akad. Förh. n. 9, pp. 37, 47. 1879.

Thallus squamulose, the squamules closely adnate, usually contiguous and forming a crust, small to rather large, circular to lobed, the upper surface usually some shade of brown, rarely grayish- or greenish-white, often minutely reticulate, the margin entire to lobed and sometimes crisped, dark below, KOH –, I–. Hypothallus black, frequently delimiting the squamules. Apothecia often conglomerate, 0.4–0.8 mm. wide, adnate,



the disk plane or nearly so, reddish-brown to black, bare, the margin thin, usually disappearing. Hypothecium conglutinate, hyaline, the hyphae  $2-4\mu$  in diameter, with thin walls, more or less vertically arranged except for the lowermost part. Exciple continuous with the hypothecium, externally dark reddish-brown, the hyphae  $5-8\mu$  in diameter, with thin or moderately thin walls, radially arranged, dark at the tips. Hymenium intensely reddish-brown above, with abundant granular matter, hyaline below and continuous with the hypothecium, KOH olivaceous-brown above,  $60-70\mu$  thick, the paraphyses coherent,  $2-2.5\mu$  in diameter, brown and usually enlarged to  $3-5\mu$  above. Spores hyaline, non-septate, oblong-ellipsoid or ellipsoid,  $11-16 \times 5-6\mu$ .

On earth, Mt. Marcy, 3010, 3015, 3022, 3106, 4265, 4303; reported from Vermont, New Hampshire, Colorado, and Washington, and from Europe.

5b. Exciple more or less pseudoparenchymatous externally

7. LECIDEA GELATINOSA Floerke, Gesellsch. Naturforsch.  
Freunde Berlin Mag. 3: 201. 1809.

Thallus thin, greenish-gray or olivaceous-green, membranous to sub-verruculose, the verrucules more or less fused and indistinct,  $0.05-0.1$  mm. wide, rarely inconspicuously soresiate, KOH with a slight brown stain, I-. Apothecia solitary or confluent,  $0.4-1.5$  mm. wide, adnate to subinnate, the disk plane to moderately convex, dark olivaceous-brown to black, bare, the margin when present very thin, pale whitish or olivaceous, sometimes white-fimbriate, often disappearing. Hypothecium nearly hyaline to olivaceous-yellow, in KOH unchanged or with a reddish tint, the hyphae  $2-5\mu$  in diameter, with thin to moderately thick walls, usually vertically arranged above, irregularly arranged below. Exciple more or less continuous with the hypothecium, dark and granular externally, within olivaceous-green or concolorous with the hypothecium, often with much granular matter instantly dissolving in KOH and the tissue becoming moderately olivaceous throughout or with a reddish tint externally, the hyphae irregularly arranged within, externally with closely-placed septa forming a distinct pseudoparenchymatous cortical tissue, the cells  $3-7\mu$  across. Hymenium coarsely granular and dark olivaceous-brown or brown-black above, pale yellowish below, in KOH tinged reddish or greenish-black above, pale reddish-brown or olivaceous-yellowish below,  $65-85\mu$  thick, the paraphyses coherent, in KOH easily separable,  $1-3$  branched,  $1.5-2.5\mu$  in diameter, usually constricted at the conspicuous septa. Spores hyaline, non-septate, ellipsoid,  $11-14 \times 4.5-5.5\mu$ .

On soil and over moss, Mt. Marcy, 3059 (det. A. H. Magnusson); Seventh Lake, 6082; known also from Nova Scotia, and reported from

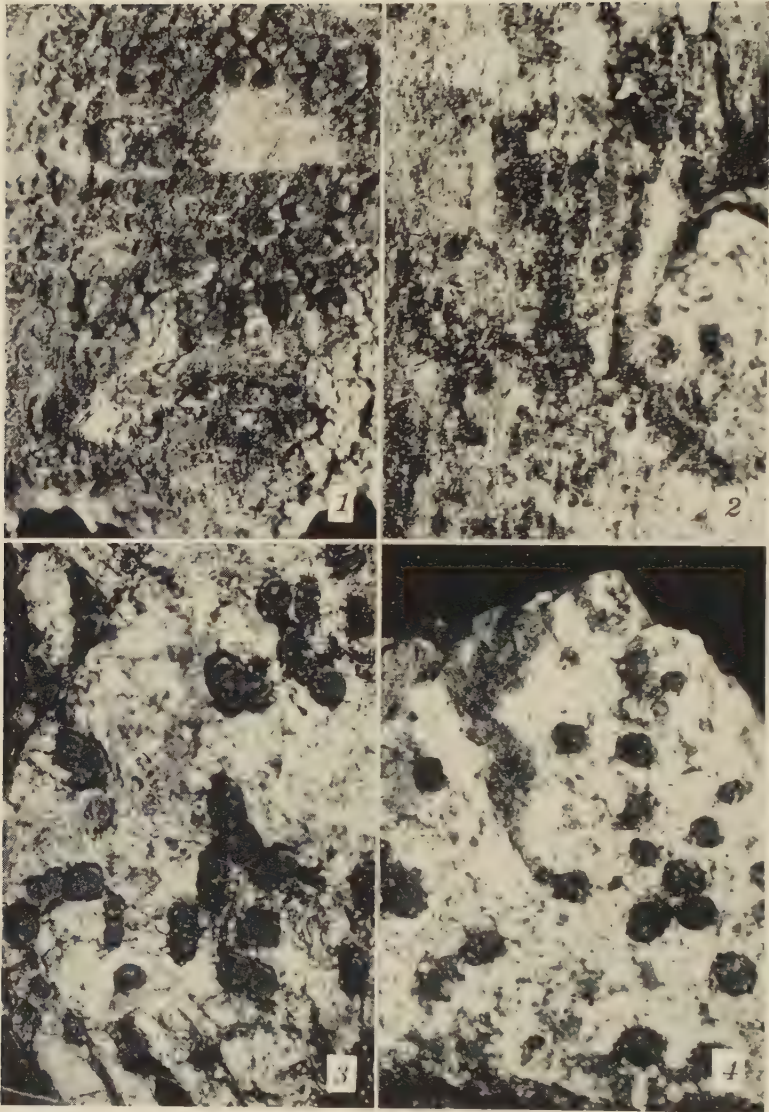


PLATE I. Habit of type specimens of certain species of *Lecidea*, all  $\times 8$ . Fig. 1. *Lecidea caeca*. Fig. 2. *Lecidea pulla*. Fig. 3. *Lecidea soredifera*. Fig. 4. *Lecidea diversa*.

New Hampshire and New Jersey; reported by Zahlbruckner from the Northern Hemisphere. It should be noted that T. Fries described the spores as being  $7-9\mu$  long (Lich. Scand. II, p. 446). The membranous thallus and the pseudoparenchymatous nature of the exciple are important diagnostic characters for the species.



8. *Lecidea caeca* sp. nov.

Pl. I, Fig. 1.

Thallus modice tenuis, olivaceo-nigricans, verrucosus, nec I, nec KOH reagens. Apothecia 0.3–0.5 mm. lata, adnata, disco plano aut leviter convexo, atro, nudo, margine demum tenui. Hypothecium incoloratum. Excipulum exteriore et maiore parte intense fuscum et pseudoparenchymaticum, interiore et angusta parte incoloratum et plectenchymaticum. Hymenium superne nigricans, 50–65 $\mu$  crassum, paraphysibus gracilibus, modice ramosis. Sporae incoloratae, simplices, octonae, oblongo-ellipsoideae vel ellipsoideae, 11–13 $\times$ 5–6 $\mu$ . Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope St. Huberts, New York, J. L. Lowe n. 5533.

Thallus moderately thin, olivaceous-blackish, verrucose, the verrucules 0.1–0.2 mm. wide, more or less fused below, I –, KOH–. Apothecia 0.3–0.5 mm. wide, adnate, the disk at first concave, becoming plane or slightly convex, black, bare, the margin at first thick, becoming thin. Hypothecium hyaline, the hyphae 3–4 $\mu$  in diameter, with moderately thick walls, vertically arranged in the upper half. Exciple dark brown externally, more or less pseudoparenchymatous, within hyaline and plectenchymatous in a narrow layer, the hyphae 5–8 $\mu$  in diameter, with thin walls. Hymenium blackish above, pale brown below, KOH scarcely changing or with a slight purple tint above, 50–65 $\mu$  thick, the paraphyses coherent, readily separating in KOH, several times branched, 1.5 $\mu$  in diameter or sometimes enlarged to 2 $\mu$  above. Spores hyaline, non-septate, oblong-ellipsoid or ellipsoid, 11–13 $\times$ 5–6 $\mu$ . Algal cells oval to subglobose, green or yellowish-green, rarely forming autospores, 5–18 $\mu$  in diameter.

On white pine bark, Chapel Pond near St. Huberts, 5533 (type); not known elsewhere. *L. flexuosa* closely resembles this species but differs in the smaller spores. *L. granulosa* also resembles this species but differs in the larger size of the verrucules of the thallus and in the more narrowly marginate or immarginate apothecia.

9. *Lecidea pulla* sp. nov.

Pl. I, Fig. 2.

Thallus tenuis, obscure olivaceo-cinereus, subverrucosus, nec KOH, nec I reagens. Apothecia 0.3–0.4 mm. lata, basi modice constricta, disco demum fere plano, atro, nudo, margine persistenter crassiore. Hypothecium incoloratum. Excipulum exteriore et maiore parte intense fuscum, pseudoparenchymaticum, interiore et angusta parte incoloratum, plectenchymaticum. Hymenium superne olivaceo-fuscum aut aeruginoso-nigricans, 70–100 $\mu$  crassum, paraphysibus gracilibus, modice ramosis. Sporae incoloratae, simplices, octonae, late ellipsoideae, 11–13 $\times$ 8–9 $\mu$ . Specimen

typicum in Herbario Universitatis Michiganensis conservatum, lectum prope St. Huberts, New York, J. L. Lowe n. 5512.

Thallus thin, dark olivaceous-gray, subverrucose, the verrucules 0.15–0.3 mm. wide, below more or less fused, KOH<sup>+</sup>, I<sup>–</sup>. Apothecia 0.3–0.4 mm. wide, moderately constricted below, the disk at first depressed, becoming nearly plane, black, bare, the margin usually remaining quite thick. Hypothecium hyaline, KOH unchanged, I blue then reddish-brown, the hyphae 3–4 $\mu$  in diameter, with moderately thick walls, vertically arranged in the upper half. Exciple dark brown and pseudoparenchymatous externally, hyaline and plectenchymatous in a narrow layer within, unchanged in KOH and I, the hyphal tips 5–8 $\mu$  in diameter, with thin walls. Hymenium olivaceous-brown to greenish-black above. KOH intensely or slightly purple, below hyaline, I blue then intensely reddish-brown, 70–100 $\mu$  thick, the paraphyses coherent, in KOH readily separable, usually several times branched, 1–2 $\mu$  in diameter. Spores hyaline, non-septate, broadly ellipsoid, 11–13 $\times$ 8–9 $\mu$ . Algal cells more or less globose, green or yellowish-green, rarely forming autospores, 5–16 $\mu$  in diameter.

On white birch bark, Chapel Pond near St. Huberts, n. 5512 (type); and not known elsewhere. *L. caeca* and *L. flexuosa* are similar, but both differ in having narrower spores. *L. granulosa* is also somewhat similar, but differs in the external characters of the apothecia and in the narrower spores.

4b. Apothecia usually provided with a veil and frequently proliferating; spores up to 21 $\mu$  long

10. LECIDEA COARCTATA (J. E. Smith) Nyl., Act. Soc. Linn. Burd.

21: 358. 1857.

*Lichen coarctatus*, J. E. Smith, in Sowerby, Engl. Bot., vol. 8, pl. 534. 1799.

Thallus thin and membranous to moderately thick and verrucose or areolate or areolate-diffract, whitish to greenish- or brownish-gray, KOH<sup>–</sup>, I<sup>–</sup>. Apothecia 0.3–1 mm. wide, at first immersed within the verrucules, soon emerging and becoming adnate to moderately constricted below, the disk at first covered by a continuation of the exciple tissue, but soon exposed by an irregular central pore which widens, sometimes leaving a lacerate to crenulate, white to olivaceous tissue attached to the margin, or rarely the apothecia typically lecidoid, at first immarginate, developing a thin, persistent margin concolorous with the disk, usually proliferating and the persistent margins concentrically arranged, the younger superior to the older ones. Hypothecium nearly hyaline to pale brownish, the hyphae 1.5–4 $\mu$  in diameter, with thin to very thick walls, closely interwoven. Exciple moderately dark reddish-brown externally, the innermost part paler and concolorous with the hypothecium, the hyphae usually



closely interwoven throughout, and as in the hypothecium or slightly wider, indistinctly parallel forming a poorly developed cortical layer with hyphae up to  $7\mu$  in diameter, with thin walls. Hymenium usually more or less reddish-brown above, pale brown or pale pinkish-brown below due to the spores, in KOH with a strong tinge of yellow above,  $90-150\mu$  thick, the paraphyses separable, much branched and interwoven above,  $1-2\mu$  in diameter. Spores hyaline or frequently pinkish, non-septate, oblong-ellipsoid to broadly ellipsoid,  $13-21 \times 6-13\mu$ .

On rocks, Boreas River, 5157; Chapel Pond, 3708, 3770, 3823, 5550; Marcy Brook, 3381, 3406, 3526; Mt. Colden, 6225, 6259; Mt. Marcy, 2747, 2957, 3020, 3081; Newcomb, 3865, 3884, 3896, 3976; Seventh Lake, 4430, 6097; Warrensburg, 3595, 5447, 5857, 5902, 5924; reported from the more temperate regions of the world.

Although this species is placed in the genus *Lecanora* by some authors, the structure of the apothecium indicates that it is closely related to *Lecidea Brujeriana* (Schaer.) Leight. and, less closely, to *L. granulosa* and its associated species. The cover over the young disk, stated by some authors to be thalline in origin, appears from hand sections to arise principally as an extension of the exciple, the thalline margin, or amphithecium, being restricted to the lower marginal portions.

## II. LECIDEA OBTEGENS T. Fries.

*Biatora coarctata* \**obtegens* T. Fries, Bot. Not., p. 152. 1867.

Thallus moderately thin and grayish-brown and, according to Vainio, also thick and olivaceous-brown or grayish-green, verrucose, the verrucules  $0.15-0.3$  mm. wide, the surface plane to strongly convex and in the latter the cortex often broken forming granular, whitish soredia. Apothecia in our specimen poorly developed and sterile, but structurally as in *L. coarctata*; according to Vainio  $0.5-0.7$  mm. wide, at first innate in the thallus, soon adnate or sometimes slightly constricted below, the disk plane or slightly convex, brown or reddish-brown, bare, the margin thin, concolorous with the thallus, appearing lecanorine or lecideoid, persistent or rarely becoming excluded. Hypothecium pallid or colorless, of irregularly arranged hyphae. Hymenium brownish or pallid-reddish above, the paraphyses strongly coherent. Spores ellipsoid,  $10-18 \times 6-9\mu$ .

On rock, Boreas River, 5168; elsewhere known from Europe. The determination was made by comparison with Vainio's description, as no other specimens have been seen. This species represents a sorediate condition of *L. coarctata*. The soredia in the one specimen collected are inconspicuous and often appear to precede the emergence of the apothecia.

3b. Hypothecium pale brown to dark brown

12. *LECIDEA ULIGINOSA* (E. Fries) Nyl., in Hue, Addend. II, p. 135.  
1888 (not *Lichen uliginosus* Schrad., Crypt. II, p. 14,  
Lief. n. 163. 1797).

*Biatora uliginosa* E. Fries, Lich. Suec. Exs. VIII, n. 218. 1824 (according to Vainio).

Thallus thin to well-developed, olivaceous- or reddish-brown to dark brown, of compacted verrucules 0.05–0.15 mm. in diameter, KOH with a reddish-brown stain, I-. Apothecia usually solitary, 0.3–0.6 mm. wide, adnate or moderately constricted below, the disk plane to moderately convex, the margin at first thin, olivaceous- or reddish-brown or concolorous with the disk, often disappearing. Hypothecium pale olivaceous-brown to reddish-brown and brown-black, the hyphae 1.5–3  $\mu$  in diameter, with thick walls, vertically arranged above or throughout. Exciple brown-black or dark reddish-brown, the hyphae 5–11  $\mu$  in diameter, with walls in part carbonized, radially arranged, the cross walls conspicuous making the tissue appear distinctly pseudoparenchymatous. Hymenium dark olivaceous- or reddish-brown to brown-black above, pale reddish-brown below, 80–100  $\mu$  thick, the paraphyses usually hyphoid, coherent, in KOH easily separable, 1 to several times branched, 1.5–2  $\mu$  in diameter or brownish and enlarged to 4  $\mu$  above. Spores hyaline, non-septate, oblong-ellipsoid to ellipsoid, 10–14 (19)  $\times$  5–7 (9)  $\mu$ .

On peaty soil or old wood, Mt. Marcy, 2984, 4168; Newcomb, 2930, 3905, 6050; Warrensburg, 3598, 5416, 5633, 5697, 5698; reported from throughout the Northern Hemisphere. The close relation of this species to *L. granulosa* and its associated species seems clear from a study of the apothecial structure; the chief distinction is in the color of the hypothecium.

Var. *HUMOSA* (Ehrh.) Ach., Meth. Lich., p. 43. 1803.

*Lichen humosus* Ehrh., Pl. Crypt., n. 135. 1789 (according to Vainio).

Thallus thin, verruculose, the verrucules very minute, 0.05 mm. or less wide, more or less compacted and fused; apothecia minute, 0.15–0.3 mm. wide.

On peaty soil, Chapel Pond, 5183; and Mt. Marcy, 3333, 4185; reported from Kentucky and Ohio, and elsewhere as in the species. This variety is considered a valid species by Vainio, but the specimens seen intergrade too much to warrant a specific separation.

13. *LECIDEA FRIESII* Ach., in Liljebl., Utk.  
Svensk. Flora, ed. 3, p. 610. 1816.

*Psora Friesii* (Ach.) Hellb., Kgl. Sv. Vet.-Akad. Handl. n.s. 9<sup>11</sup>: 61. 1871.

Thallus squamulose, the squamules usually closely appressed, olivaceous-brown or reddish-brown, sometimes grayish-green, the margin entire to lobate, below smooth, whitish, KOH-, I-. Apothecia 0.3–0.5 mm.



wide, or according to Vainio up to 1 mm. wide, adnate to somewhat constricted below, the disk usually remaining depressed, black, bare, the margin elevated, often angular. Hypothecium hyaline above in a narrow layer, dark reddish-brown below, the hyphae (below)  $2.5-3.5\mu$  in diameter, with thin or moderately thin walls which become carbonized, irregularly arranged. Exciple continuous with the darker part of the hypothecium, carbonaceous, the hyphae  $3-4\mu$  in diameter, with moderately thick and dark walls, radially arranged. Hymenium dark olivaceous-brown above, pallid below, in KOH the granular matter above entirely dissolving and hymenium becoming more or less hyaline throughout,  $40-50\mu$  thick, the paraphyses moderately coherent, in KOH easily separable, about  $2-2.5\mu$  in diameter. Spores hyaline, non-septate, ellipsoid,  $7-9 \times 3-4\mu$ .

On old and especially on burnt wood, Chapel Pond, 5470; Newcomb, 5034, 5031, 5036, 6018, 6048, 6061; and Warrensburg, 5639, 5769; reported from Vermont, Massachusetts, and California, and from Europe.

14. *LECIDEA FUSCOCINEREA* Nyl., Nya Bot. Not., p. 177. 1852.

Thallus rather thick, dark gray or dark grayish-brown, areolate, the areoles 0.2-0.5 mm. wide, usually convex above, KOH- or sometimes yellowish, I-. Hypothallus black, usually prominent. Apothecia more or less immersed in the areoles, up to 0.5 mm. wide, disk remaining plane, black, bare, the margin thin, becoming flexuous. Hypothecium pale above, dark and continuous with the exciple below, the hyphae  $3-4\mu$  in diameter, with moderately thick walls, irregularly arranged or vertically arranged in the paler part. Exciple continuous with the lower part of the hypothecium, dark reddish-brown, sometimes somewhat pseudoparenchymatous externally or of irregularly arranged hyphae throughout. Hymenium confluent with the hypothecium, above dark reddish- or olivaceous-brown, containing dark and coarse granular matter which mostly dissolves in KOH, about  $50\mu$  thick, the paraphyses about  $1.5\mu$  in diameter, hyphoid, much branched and frequently articulate, usually forming an interwoven epithecium above. Spores hyaline, non-septate, broadly ellipsoid to subglobose,  $8-9 \times 5-5.5\mu$  or  $5-6\mu$  in diameter.

On rock, Mt. Marcy (5300 ft. elev.), 4255; reported from the White Mountains and from Europe. The external appearance of the thallus of *L. fuscocinerea* may exhibit the typical color and general character of the species allied to *L. fuscoatra* (L.) Ach. and, apparently for this reason, it has been associated with the latter species by T. Fries and Vainio. The internal structure of the apothecium, however, resembles more closely that of *L. granulosa* and allied species.

2b. Paraphyses not hyphoid, distinctly differentiated, stout, usually enlarged and brown above

15. *LECIDEA ARCUATULA* (Arn.) Hue, Nouv. Arch. du  
Muséum, sér. 3, 3: 129. 1891.

*Biatora arcuatula* Arn., Flora 71: 107. 1888.

Thallus moderately thin to thick, verrucose or verrucose-areolate, the verrucules 0.15–0.5 mm. across, or areoles up to 1.5 mm. across, plane to convex above, grayish-white to grayish-green or olivaceous, I–, KOH–. Hypothallus brown-black or absent. Apothecia solitary or occasionally conglomerate, 0.4–1 mm. wide, adnate to moderately constricted below, the disk slightly depressed at first, becoming plane to slightly convex, brown-black to black, bare or slightly white-pruinose, the margin thinning but usually persistent, often becoming flexuous. Hypothecium hyaline, the hyphae 3–8 $\mu$  in diameter, with walls of variable thickness, vertically arranged throughout or at least above. Exciple arising from the lower part of the hypothecium, dark brown externally, more or less brownish within and usually with much granular matter which dissolves at once in KOH, the hyphae in the outer part 4–10 $\mu$  in diameter, with moderately thick walls, somewhat carbonized or the carbonaceous material in the interstices, the hyphae within about 5 $\mu$  in diameter, with moderately thin walls. Hymenium usually dark brown above, hyaline to pale brownish below, 65–80 $\mu$  thick, the paraphyses coherent, in KOH easily separable, 2–2.5 $\mu$  in diameter, often somewhat constricted at the cross-walls, usually brown and enlarged to 3–8 $\mu$  above. Spores hyaline, non-septate or sometimes becoming in part 1-septate, usually reniform, 10–13 $\times$ 3.5–5 $\mu$ .

On rock, Avalanche Lake, 6156; Newcomb, 6052, 6053; known elsewhere from Maine and Labrador, and also reported from Newfoundland and West Virginia by Magnusson. The species is closely related to and often confused with *L. rivulosa* Ach. which, however, has wider spores, 5–7 $\mu$  wide according to Magnusson.

16. *LECIDEA PRAERUPTORUM* Du Rietz et H. Magn., in Du Rietz, Zur meth.  
Grundl. d. mod. Pflanzensoz., p. 164, Tab. 21, footnote. 1921.

Thallus moderately thick to thin, verrucose, gray, and, according to Magnusson, also grayish-brown, the verrucules 0.15–0.3 mm. wide, crowded, convex to nearly plane above, in part breaking up into grayish- or greenish-yellow soredia, I–, KOH–. Hypothallus black or absent. Apothecia 0.5–1.5 mm. wide, constricted below and elevated above the thallus, disk plane at first, finally more or less convex, brownish-black, the margin thin, often flexuous, finally disappearing. Hypothecium white or pale brownish. Exciple intergrading with the hypothecium, dark brown externally, pale brown within, the hyphae radially arranged. Hymenium dark brown above, pale brown below, 100–125 $\mu$  thick, the paraphyses coherent, 2–2.5 $\mu$  in diameter, sometimes brown and enlarged above to 5 $\mu$ . Spores

hyaline, ellipsoid or cylindric-ellipsoid, sometimes slightly curved,  $9-12 \times 4-5\mu$ .

On rocks, Warrensburg, 3539; reported elsewhere from Sweden. The few apothecia originally present were destroyed in making the determination and, since the data was imperfectly recorded, the apothecial characters are taken from Magnusson's paper on the *Lecidea rivulosa* group (Göteb. Kgl. Vet. o. Vit.-Samh. Handl. 29<sup>4</sup>: 13. 1925). Dr. Magnusson examined the sterile plant and stated that it seemed to be typical.

17. LECIDEA LOWENSIS H. Magn., Med. f. Göteb.  
Bot. Trädg. 10: 11. 1936.

Thallus verrucose to verrucose-areolate, dark gray to grayish-brown or brown, KOH-; I medulla blue. Hypothallus black or brown-black. Apothecia solitary or sometimes conglomerate, 0.4-1.0 mm. wide, subimmersed to adnate, rarely slightly constricted below, disk depressed to plane at first, becoming plane to moderately convex, brown-black to black, bare, the margin thinning but persistent. Hypothecium hyaline to pale brownish, the hyphae  $3-6\mu$  in diameter, with walls of variable thickness, loosely and vertically arranged throughout or more often irregularly arranged below. Exciple usually continuous with the lower part of the hypothecium, externally dark brown or red-brown, within hyaline to pale brownish, with the color in the radial interstices, in KOH granular matter when present dissolving, the hyphae  $4-8\mu$  in diameter, with walls of variable thickness, more or less radially arranged. Hymenium dark reddish-brown to brown-black above,  $60-110\mu$  thick, the paraphyses sometimes quite coherent, in KOH readily separable, about  $2-2.5\mu$  in diameter, with thick walls, usually colored and enlarged to  $6\mu$  above. Spores hyaline to pale brown, non-septate, oblong with rounded ends or broadly ellipsoid,  $8-11 \times 5-7\mu$ .

On rock, Mt. Marcy at 4900-5300 ft. elev., 2603, 2710, 2860 (type), 3068, 4192, 4300; Mt. MacIntyre at 4900 ft. elev., 3482; known elsewhere from Mt. Moosilauke, N. H., no. 311 Dec. N. Am. Lich. According to Dr. Magnusson (letter) the species is most closely allied by its structure to *L. circumflexa* Nyl. The medulla of the thallus of *L. demolita* Vain. reacts similarly to I, but in this species, according to Vainio's description, the upper part of the hymenium is greenish-black.

18. LECIDEA KOCHIANA Hepp., Würzburg's Lich.-Fl., p. 61. 1824.

Thallus variable in thickness, usually more or less grayish-brown, or grayish-green or whitish-green, verrucose to commonly areolate, or areolate-diffract, the areoles 0.2-1 mm. across, KOH-, I-. Apothecia solitary or sometimes conglomerate, 0.5-1.5 (2.0) mm. wide, at first immersed in



the verrucules, emerging but scarcely projecting above the level of the thallus, the disk dark brown to black, bare, the margin becoming thin but usually persisting. Hypothecium hyaline to pale brown, KOH unchanged or sometimes with some granular matter which instantly dissolves, the hyphae 3-6 (8) $\mu$  in diameter, with walls of variable thickness, vertically arranged almost throughout or in the upper part. Exciple continuous with the hypothecium, usually from the lower part, dark brown externally, pale brown to hyaline within, with granular matter which dissolves at once in KOH, the hyphal tips 3-5 $\mu$  in diameter, radially arranged, brown. Hymenium more or less brown above, pale brown to hyaline below, 70-80 $\mu$  thick, the paraphyses readily separable to moderately coherent, readily separable in KOH, 2-2.5 $\mu$  in diameter, often brown and somewhat enlarged to 5 $\mu$  above. Spores hyaline, non-septate, oblong-ellipsoid with rounded ends or broadly ellipsoid, 8-11 $\times$ 5-7 (8) $\mu$ .

On rocks, Avalanche Lake, 6237; Mt. Marcy, 2604, 2607, 2665, 2668, 2888, 2946, 3027, 3037, 3041, 3187, 3197, 4288; reported from Labrador and Newfoundland and from Europe.

Var. *SUBREAGENS* H. Magnusson, Med. f. Göteb. Bot. Trädg. 10: 10. 1936.

As in the species but the thallus and apothecia producing a yellow stain in KOH.

On rocks, Mt. Marcy, 2701, 2836, 3096, 3111 (all det. Magnusson); also reported by Magnusson from West Virginia.

rb. Excipular hyphae gelatinized, conglutinate, or embedded in a gelatinous matrix, radially arranged

2a. Hypothecium brown or black, the hyphae usually becoming more or less carbonized (see also 77. *L. adirondackii* and 79. *L. caesiocetra*)

3a. Exciple usually distinctly colored within

4a. Spores large, 5-9 $\mu$  or more wide, usually 15-24 $\mu$  or more long

5a. Exciple well-developed, the hyphae, at least in young apothecia, more or less gelatinized or conglutinate and strongly divergent

19. *LECIDEA STERIZA* (Ach.) Vain., Ark. f. Bot. 8<sup>1</sup>: 144. 1909.

*L. confluens*  $\gamma$  *L. steriza* Ach., Meth. Lich., p. 40. 1803.

*L. macrocarpa* (DC.) T. Fries, Lich. Scand. II, p. 505. 1874 (emend.).

*L. platycarpa* Ach., Lich. Univ., p. 173. 1810.

Thallus absent or thin, membranous, smooth and rimose, or thicker and verrucose to verrucose-areolate and areolate-diffract, white to grayish-green or dark gray, I-, KOH-. Hypothallus thin, black, or absent. Apothecia usually solitary, 0.5-2 mm. wide, adnate to moderately constricted below, the disk depressed or plane to strongly convex, brown-black to black, bare or pruinose, the margin thick and raised or thin and plane, persistent or disappearing. Hypothecium with a hyaline layer above, thin or reaching 40 $\mu$  in thickness, below dark olivaceous-brown to brown-black,

the hyphae  $2-4\mu$  in diameter, with thin to moderately thick walls, irregularly arranged or vertically arranged above to a thickness of  $80\mu$ . Exciple more or less continuous with the hypothecium, within pale reddish-brown or olivaceous-brown to brown-black and in the last opaque except in very thin sections, externally often somewhat olivaceous- or bluish-black, and often covered with a hyaline gelatinous layer up to  $5\mu$  thick, the color in the interstices of the hyphae which are  $4-9\mu$  in diameter, the lumina wide in the pale tissue, becoming narrow in the dark tissue, indistinctly radially arranged, highly conglomerate. Hymenium olivaceous-brown or varying through olive-green tints to olivaceous-black above,  $80-120\mu$  thick, the paraphyses coherent, or in KOH sometimes easily separable below, unbranched to several times branched or almost net-like, about  $1.5-2\mu$  in diameter, sometimes enlarged to  $3.5\mu$  above. Spores hyaline, non-septate, subfusiform or oblong-ellipsoid to ellipsoid,  $13-24 \times 5-9\mu$ .

An extremely variable plant with many intergrading forms, common on rocks throughout the Adirondack region; Boreas River, 5201; Chapel Pond, 3680, 3732, 3738, 3741a, 3743, 3745, 3772, 3774, 3775, 3785, 5461, 5464, 5465, 5486, 5487, 5495, 5499, 5500, 5539, 5549, 5578, 5581, 5596, 5613; Marcy Brook, 2647, 2657, 2659, 2661, 3397, 3402, 3413, 3498, 3529, 4164, 4320, 4321, 4325, 6286, 6290, 6293, 6302, 6320, 6325, 6327, 6374, 6412; Mt. Colden, 6120, 6123, 6125, 6133, 6134, 6148, 6160, 6162, 6168, 6194, 6196, 6230, 6239, 6252, 6261; Mt. Marcy, 2612, 2629, 2635, 2636, 2676, 2679, 2724, 2733, 2743, 2814, 2826, 2840, 2959, 2960, 2998, 3019, 3042, 3108, 3121, 3124, 3129, 3160, 3228, 3261, 3270, 3339, 3340, 3350, 3384, 4260, 4271, 4278, 4304; Mt. MacIntyre, 3480; Newcomb, 3915, 3924, 3987, 3997, 4002, 4074, 4137, 4138, 4547, 4552, 4557, 4559, 4561, 4574, 4575, 4632, 4696, 4705, 4719, 4734, 4840, 4876, 4931, 5010, 5038, 5040, 5042; Seventh Lake, 6079, 6080, 6088, 6091, 6104; Warrensburg, 3542, 3544, 3571, 3594, 5407, 5412, 5414, 5632, 5673, 5722, 5736, 5737, 5738, 5815, 5881, 5928, 5934, 5961, 5962, 5967, 5975, 5980; reported from the more temperate regions of the world.

## 20. *Lecidea soredifera* sp. nov.

Pl. I, Fig. 3.

Thallus parum evolutus, membranaceus aut verrucosus, sordide cinereus, indistincte albo-punctatus sorediis inconspicuis, nec I, nec KOH reagens. Hypothallus ater, tenuis. Apothecia  $0.5-1$  mm. lata, adnata aut basi modice constricta, disco depresso aut plano aut leviter convexo, atro, nudo, margine crasso, persistente. Hypothecium obscure fuscum aut superne et angusto parte incoloratum. Excipulum extus pallide aeruginoso-nigricans, intus pallide olivaceo-fuscum aut omnino fusco-nigrum, demum carbonisatum. Hymenium superne olivaceo-fuscescens aut olivaceo-nigricans et saepe pallide at distincte aeruginoso-nigricans,  $100-110\mu$  crassum, paraphysibus cohaerentibus, superne parce ramosis, gracilibus aut superne leviter incrassatis. Sporae incoloratae, simplices, octonae, ellipsoideae aut subfusiformae,  $16-20 \times 7-8\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, legit R. C. Lowe in Mt. Marcy prope Lake Placid, J. L. Lowe n. 2961.

Thallus poorly developed, discontinuous, membranous or verrucose, the verrucae discrete, up to  $0.3$  mm. wide, sordid gray, white-punctate

with inconspicuous soredia, I<sup>-</sup>, KOH<sup>-</sup>. Hypothallus black, thin. Apothecia 0.5–1 mm. wide, adnate to moderately constricted below, the disk at first depressed, remaining depressed or becoming plane to slightly convex, black, bare, the margin thick, persistent. Hypothecium dark brown or above hyaline in a layer up to 40 $\mu$  thick, KOH slightly darkening, I<sup>-</sup> except the upper hyaline part becomes blue, the hyphae 2.5–4 $\mu$  in diameter, with thin or moderately thin walls, more or less vertically arranged, becoming carbonized. Exciple brown-black throughout or externally pale greenish-black and within pale olivaceous-brown, KOH<sup>-</sup>, I<sup>-</sup>, the color in the interstices of the hyphae which are 4–5 $\mu$  in diameter with narrow lumina, and radially arranged, at first somewhat conglutinate then becoming carbonized. Hymenium olivaceous-brownish or olivaceous-blackish and usually with a pale but distinct greenish-black tinge above, KOH<sup>-</sup>, I blue except the asci become reddish-brown, 100–110 $\mu$  thick, the paraphyses coherent, 1–3 times branched above, 1–1.5 $\mu$  in diameter or above sometimes enlarged to 2.5 $\mu$ . Spores hyaline, non-septate, 8 in an ascus, ellipsoid or subfusiform, 16–20  $\times$  7–8 $\mu$ . Algal cells green or yellowish-green, oval to subglobose, 5–16 $\mu$  in diameter; no autospores seen.

On rock, Mt. Marcy (elev. 4600–5300 ft.), 2961 (type, coll. R. C. Lowe), 3328, 4270; not known elsewhere. *L. steriza* agrees with this species in all characters except that the thallus is not sorediate. *L. soredizodes* (Nyl.) Vain., as described by Vainio, has a thicker thallus and larger spores.

21. LECIDEA PHYLLISCINA Nyl., Flora 56: 21. 1873.

Thallus lacking or thin, greenish-gray to dark gray, membranous and smooth to cracked and areolate, KOH<sup>-</sup>, I<sup>-</sup>. Apothecia 0.5–1.8 mm. wide, adnate to moderately constricted below, the disk at first depressed, remaining slightly depressed or becoming plane to moderately convex, brown-black to black, bare, the margin thick and persistent. Hypothecium with a hyaline layer above reaching a thickness of 50 $\mu$ , brown-black below, the hyphae 3–5 $\mu$  in diameter, with walls at first thin, then thickening and darkening, irregularly arranged. Exciple continuous with the hypothecium, yellowish-brown to brown-black, in KOH<sup>-</sup> inner portion maroon-red, the coloring matter in the interstices of the hyphae which are 4–8 $\mu$  in diameter, the wide lumina becoming nearly obliterated in the darker tissue, irregularly radially arranged, conglutinate. Hymenium olivaceous or yellowish-brown above, 85–100 $\mu$  thick, the paraphyses coherent, about 1.5–2 $\mu$  in diameter except usually enlarged to 2.5–4 $\mu$  above. Spores hyaline, non-septate, ellipsoid, 16–19  $\times$  7–9 $\mu$ .

On rock, Mt. Colden, 6127, 6201; Newcomb, 4562; and Warrensburg, 3540, 5426, 5814, 5820; reported elsewhere from northern and western Europe. The internal structure is like that of *L. steriza*, which differs principally in the negative reaction of the exciple to KOH.



## 22. LECIDEA CRUSTULATA (Ach.) Sprengl., Syst.

Veg. IV, pars I, p. 258. 1827.

*Lecidea parasema*  $\delta$  *crustulata* Ach., Lich. Univ., p. 176. 1810 (emend.).

Thallus absent or membranous or subverrucose, whitish to gray, I-, KOH-. Hypothallus sometimes present, thin, black, sometimes interrupting the thallus. Apothecia 0.3–0.8 mm. wide, adnate, the disk depressed or becoming plane or rarely moderately convex, black, bare, the margin at first thick, thinning somewhat but usually persistent. Hypothecium more or less hyaline above to a thickness of  $25\mu$ , brown-black below, the color in the interstices of the hyphae which are  $4\text{--}5\mu$  in diameter, irregularly arranged. Exciple brown- or olivaceous-black externally, pale or slightly darkened within, with a variable but small amount of dark granular matter in the reddish interstices of the hyphae which are  $4\text{--}12\mu$  in diameter with confluent walls except where separated by the interstitial granules, with lumina  $2\text{--}2.5\mu$  wide, radially arranged, highly conglutinate. Hymenium olivaceous-brown above,  $80\text{--}90\mu$  thick, the paraphyses coherent, in KOH coherent or moderately separable, about  $1.5\mu$  in diameter and enlarged above to  $3\mu$ . Spores hyaline, non-septate, ellipsoid or subfusiform,  $13\text{--}19 \times 5\text{--}8\mu$ .

On rocks, Chapel Pond, 5182, 5548, 5558, 5561; Marcy Brook, 3431, 3511; and Newcomb, 4001, and 4984; reported from the temperate regions of the world.

The species is scarcely more than a diminutive form of *L. steriza*, but is here treated as a valid species following current European practice. In *L. steriza* the apothecia are usually much wider and the hymenium is thicker than in *L. crustulata*.

## 23. LECIDEA PANAEOLA Ach., K. Vet. Ak. N.

Handl., p. 267. 1808 (p.p.).

Thallus verrucose, the verrucules 0.3–0.8 mm. wide, convex above, gray-green, I-, KOH-, with scattered pink cephalodia. Hypothallus black, rather prominent. Apothecia occurring between the verrucules, level with or slightly exceeding the thallus, 0.5–0.7 (1) mm. wide, adnate, the disk black, bare, with a sub-persistent, thick margin. Hypothecium and exciple carbonaceous-brown. Hymenium narrowly brown-black above, with a thin granulose cover, up to  $150\mu$  thick, the paraphyses strongly coherent, slender, not enlarged above. Spores hyaline, thick-walled, ellipsoid or more or less angular due to compact arrangement within the ascus,  $22\text{--}27 \times 9\text{--}15\mu$ .

On rocks, Mt. Colden, 6194a; and Marcy Brook, 6296; reported from the mountainous regions of the Northern Hemisphere by Zahlbruckner.

The collections cited above are sterile and, as all the other specimens seen

were also sterile, the apothecial characters have been taken from Vainio's description (Act. Soc. pro Fauna Flora Fenn. 57<sup>2</sup>: 150. 1934).

24. *Lecidea diversa* sp. nov.

Pl. I, Fig. 4.

Thallus tenuis aut modice crassus, verrucoso-areolatus aut areolatus, albidus aut cinereo-albidus, nec KOH, nec I reagens. Hypothallus ater, bene aut indistincte evolutus. Apothecia 0.5–1.5 mm. lata, adnata aut leviter immersa, disco depresso aut bene convexo, margine crasso, aut rare demum immarginata. Hypothecium olivaceo-nigricans aut cyanescenti-nigricans, aut interdum inferne fusco-nigrum. Excipulum extus cyanescenti-nigricans aut nigrescens, intus pallidum. Hymenium superne obscure olivaceo-nigrum aut aeruginoso-nigrum, 90–120 $\mu$  crassum, paraphysibus gracilibus aut apicibus incrassatis, saepe septis constrictis. Sporae incoloratae, simplices, octonae, plus minus fusiformae aut ellipsoideae aut late ellipsoideae, 16–21  $\times$  6–9 $\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum in Mt. Marcy prope Lake Placid, New York, J. L. Lowe n. 4293.

Thallus thin to moderately thick, verrucose-areolate to areolate, white or grayish-white, I<sup>+</sup>, KOH<sup>–</sup>. Hypothallus black, prominent or indistinct. Apothecia 0.4–1.5 mm. wide, adnate or slightly immersed, the disk depressed or becoming strongly convex, the margin at first thick, elevated, usually remaining thick or sometimes thinning but rarely disappearing. Hypothecium olivaceous-black or bluish-black above, sometimes brown-black in the lower portion, KOH<sup>–</sup>, I<sup>–</sup>, the color in the interstices of the hyphae which are 4–7 $\mu$  in diameter, with wide lumina, irregularly arranged, conglutinate. Exciple arising from the hypothecium, externally dark blue-black or black and occasionally with a thin hyaline cover, within pale, KOH<sup>–</sup>, I<sup>–</sup>, the hyphae 4–7 $\mu$  in diameter, with wide lumina, irregularly radially arranged. Hymenium dark olivaceous-black or greenish-black above, KOH<sup>–</sup>, I blue except the asci usually becoming reddish-brown, 90–120 $\mu$  thick, the paraphyses coherent, in KOH moderately coherent to moderately separable, simple or 1–3 times branched, 1.5–2.5 $\mu$  in diameter, often constricted at the septa, above usually somewhat darkened and sometimes enlarged to 5 $\mu$ . Spores hyaline, non-septate, 8 in an ascus, more or less fusiform to ellipsoid or broadly ellipsoid, 16–21  $\times$  6–9 $\mu$ . Algal cells green or yellowish-green, oblong to oval or rarely subglobose except in very small cells, the greater diameter 5–18 $\mu$ ; no autospores seen.

On rocks, Mt. Colden, 6177, 6180, 6181, 6182, 6188, 6189, 6217, 6218, 6219, 6220, 6223, 6224, 6227, 6244, 6250, 6260; Marcy Brook, 3425, 6287, 6289, 6295, 6298, 6318, 6343, 6345, 6354, 6360, 6379, 6395, 6397, 6399, 6401, 6405, 6407, 6408, 6414; Mt. Marcy, 2751, 3024, 3178, 3188, 4293 (type); not known elsewhere.

*L. steriza* (Ach.) Vain. resembles this species in its thallus characters and in the general structure of the apothecium, but it has a brown hypo-

thecium and an olivaceous color in the upper part of the hymenium. *L. albosuffusa* T. Fries, judging from Fries' and Vainio's descriptions, is somewhat similar, but this species occurs on a limestone substratum, the excipular and hypothecial tissues become violaceous or purplish after a rather long time in KOH, and the spores are considerably larger.

25. *LECIDEA DICKSONII* (Gmel.) Ach., Meth. Lich. p. 55. 1803.

*Lichen Dicksonii* Gmel., Syst. Nat. II, pars 2, p. 1363. 1791.

Thallus moderately thin, areolate, yellowish- or olivaceous-red to rusty red or brownish-red, the hypothallus black, often interrupting the thallus. Apothecia 0.3–0.5 mm. wide, immersed but in age freed by the breaking away of the thallus, the disk depressed or sometimes becoming plane, black, bare, the margin variable in thickness, persistent. Hypothecium with an upper hyaline layer reaching a thickness of  $30\mu$ , dark reddish-brown below, the hyphae in the brown part  $2.5\text{--}5\mu$  in diameter, with narrow lumina, irregularly arranged. Exciple continuous with the dark part of the hypothecium, dark reddish-brown throughout, with carbonaceous matter in the interstices of the hyphae which are  $4\text{--}5\mu$  in diameter, with moderately wide lumina, radially arranged. Hymenium olivaceous-green to greenish-black above,  $80\text{--}90\mu$  thick, the paraphyses coherent, several times branched to almost net-like, immersed in the hymenial jelly and the dimensions uncertain, probably about  $1.5\text{--}2.5\mu$  in diameter, with thick walls. Spores hyaline, non-septate, ellipsoid to broadly ellipsoid,  $11\text{--}13$  ( $16$ )  $\times$   $5\text{--}8\mu$ .

On rocks, Mt. Marcy, 3237, 4309, 4313, 4315, 4316, 4317; unknown elsewhere in North America, but reported by Zahlbruckner from the frigid and temperate regions of the world.

5b. Exciple thin or poorly developed, the hyphae not markedly gelatinized or conglutinate and remaining more or less parallel to the edge of the hymenium

26. *LECIDEA CINEREOATRA* Ach., Lich. Univ., p. 167. 1810.

Thallus absent, or thin and membranous, or infrequently thickened and rimose-areolate, rarely the areolae breaking up to form a more or less granulose thallus, white or grayish-green or rarely darker to dark olivaceous-brown, I–, KOH–. Apothecia 0.4–0.7 (1.4) mm. wide, adnate, slightly depressed to plane or moderately convex, black, bare, the margin thick, sometimes thinning and disappearing in the convex forms, usually fissured in age. Hypothecium without a hyaline layer above, or the layer very thin (up to  $10\mu$  thick), usually mustard-yellow or olivaceous-yellow above, soon reddish-brown or dark brown below, the hyphae  $3\text{--}5\mu$  in diameter, the walls carbonizing and the lumina becoming narrow, irregularly arranged. Exciple dark reddish-brown throughout, or paler within



and often as in the upper part of the hypothecium, the hyphae 4–5 $\mu$  in diameter, the walls carbonizing and the lumina becoming narrow, slightly divergent. Hymenium olivaceous-brown above, usually 80–90 $\mu$  thick but occasionally reaching 110 $\mu$ , the paraphyses coherent, 1.5 $\mu$  in diameter, sometimes enlarged to 3 $\mu$  above. Spores hyaline, non-septate, oblong-ellipsoid or ellipsoid, 13–19 $\times$ 6–9 $\mu$ .

On rocks, Chapel Pond, 3661, 5460, 5463, 5476, 5501, 5532, 5538; Newcomb, 3872, 3894, 3897, 3910, 3911, 3949, 3950, 4066, 4145, 4387, 4590, 4618, 4698, 4700, 4702, 4704, 4707, 4721, 4725, 4745, 4866, 4901, 4966, 4997, 5000, 5061, 5062, 6069; Seventh Lake, 6083, 6085, 6086, 6093, 6109; Warrensburg, 3736, 5222, 5406, 5413, 5430, 5435, 5436, 5439, 5448, 5627, 5678, 5689, 5699, 5709, 5806, 5817; known elsewhere from Ohio, and reported from Europe.

The fissured exciple of the older apothecia, indicating the brittle nature of the highly carbonized hyphae in the exciple, is a distinctive character for this species. As the structure of the exciple of *L. steriza* and of *L. crustulata* is entirely different, these otherwise quite similar species can be readily distinguished from *L. cinereoatra*.

The plant reported as *L. promiscens* Nyl. by Fink (Lich. Flora United States, p. 206) and renamed *L. subsimplex* H. Magn. by Magnusson (Med. f. Göteb. Bot. Trädg. 10: 29. 1936) appears to differ in no respect from the concept of *L. cinereoatra* given above.

## 27. *Lecidea columnata* sp. nov.

Pl. II, Fig. 1.

Thallus cinereus, verrucosus, nec I, nec KOH reagens. Hypothallus ater, tenuis aut parce evolutus. Apothecia 0.2–0.4 mm. lata, adnata, disco depresso, saepe columella centrali, atro, nudo, margine crasso, anguloso aut subgyroso. Hypothecium obscure fuscum. Excipulum nigrum aut obscure rufo-fuscum, carbonaceum. Hymenium superne obscure rufo-fuscum, 60 $\mu$  crassum, paraphysibus cohaerentibus, gracilibus aut superne incrassatis et fuscis. Sporae incoloratae, simplices, octonae, ellipsoideae aut late ellipsoideae, 11–12 $\times$ 5–7 $\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Lake Placid, New York, J. L. Lowe n. 6328.

Thallus gray, verrucose, the verrucules scattered, about 0.2–0.4 mm. wide, more or less convex above, I–, KOH–. Hypothallus absent or thin, black. Apothecia 0.2–0.4 mm. wide, adnate, the disk depressed, often with a central columella, black, bare, the margin thick, persistent, angular or subgyrose, frequently fissured at the angles. Hypothecium dark brown, KOH, I, the hyphae 3–4 $\mu$  in diameter, more or less vertically arranged throughout, with rather thick walls which become carbonized. Exciple black or dark reddish-brown with the color in the interstices of the hyphae, carbonaceous, KOH–, I–, the hyphae 2.5–3 $\mu$  in diameter, with a narrow lumen, radially arranged. Hymenium dark reddish-brown above, pale below, KOH brown-black or sometimes olivaceous-brown above, I

blue,  $60\mu$  thick, the paraphyses coherent, about  $2\mu$  in diameter or sometimes brown and enlarged to  $4.5\mu$  above. Spores hyaline, non-septate, 8 in an ascus, ellipsoid to broadly ellipsoid,  $11-12 \times 5-7\mu$ . Algal cells green or yellowish-green, oblong to oval or subglobose, the long diameter  $5-20\mu$ ; no autospores seen.

On rock along Marcy Brook at an elevation of 2900 ft., 6328; not known elsewhere. The external appearance of the apothecia resembles that of *Biatorrella simplex* (Dav.) Branth. et Rostr. *L. trochodes* (Tayl.) Cromb. appears to be somewhat similar but its thallus is described as usually areolate and its spores are larger,  $12-16$  ( $22$ )  $\times$   $6-10$  ( $13$ )  $\mu$  according to Vainio.

28. *LECIDEA ALBOCAERULESCENS* (Wulf.) Floerke, in  
Schrader's Neues Jour. Bot. 4: 25. 1810.

*Lichen albocaerulescens* Wulf., apud Jacques, Coll. Bot. II, p. 184, tab. 15, f. 1. 1788.

Thallus moderately thick, grayish-green or greenish-white, minutely rimose to areolate, KOH- or with a yellowish stain, I- or blue. Hypothallus black, usually absent. Apothecia 0.5-1.1 mm. wide, at first immersed, becoming adnate, at first plane, becoming slightly to moderately convex, typically white-pruinose, rarely bare, the margin at first thin, becoming moderately thick. Hypothecium dark reddish-brown, the hyphae  $4-5\mu$  in diameter, the walls carbonizing and becoming thick, vertically arranged in the upper half, irregularly arranged below. Exciple dark reddish-brown externally, paler within, unchanged in KOH except that the granules may partly or wholly dissolve, the hyphae  $2-4\mu$  in diameter or enlarged to  $5\mu$  at the apex, with slender lumina or lumina widened at the tip, cross walls numerous but inconspicuous and the tissue not appearing pseudoparenchymatous, very slowly carbonizing, parallel-arranged. Hymenium olivaceous-brown above,  $85-110\mu$  thick, the paraphyses coherent,  $1.5-2\mu$  in diameter, often slightly colored and equal or enlarged to  $2.5\mu$  above. Spores hyaline, non-septate, ellipsoid,  $14-17 \times 6-11\mu$ .

On rocks, Chapel Pond, 5184, 5513, 5599; Seventh Lake, 6077; and Warrensburg, 5899 and 5903; reported from Europe, Asia, North America, the Madeira Islands and New Zealand.

29. *LECIDEA SOREDIZA* Nyl., Flora 56: 72. 1873.

Thallus well developed, verrucose-areolate to areolate, the surface plane or nearly so, grayish or grayish-green, with inconspicuous, few to numerous, rounded, whitish or pale yellowish-green soredia slightly elevated above or depressed in the thallus, KOH-, I medulla blue. Hypothallus black, often limiting the thallus. Apothecia 1-2.5 mm. wide, at first immersed, at length emerging from the thallus, the disk plane, sometimes becoming strongly convex, black, usually more or less pruinose, or in part

bare, the margin on emergence of the apothecia becoming thin to rather thick, black. Hypothecium brown-black, the hyphae  $3-5\mu$  in diameter, with walls of varying thickness, radially arranged. Exciple continuous with the hypothecium and concolorous with it, the hyphae  $4-5\mu$  in diameter, with moderately thick walls. Hymenium olivaceous-brown or olivaceous-black above, pale below,  $100-110\mu$  thick, the paraphyses coherent,  $1-1.5\mu$  in diameter or sometimes enlarged above to  $2-3\mu$  and often darkened. Spores hyaline, non-septate, ellipsoid or oblong-ellipsoid,  $13-18 \times 6.5-11\mu$ .

On vertical rock, Mt. Marcy, elev. 5300 ft., 2705; reported from the more temperate regions of the Northern Hemisphere. This species seems closely related to *L. albocaerulescens* and is hardly more than a soresiate condition of it.

4b. Spores smaller, rarely exceeding  $16\mu$  in length, mostly not over  $5\mu$  in width

5a. Hymenium some shade of brown or pale to hyaline above

6a. Spores medium-sized,  $9-16\mu$  long

### 30. LECIDEA BERENGERIANA (Mass.) T. Fries, Lich.

Scand. II, p. 433. 1874.

*Biatora Berengeriana* Mass., Rich. Lich. Crost., p. 128. 1852.

*Biatora atrofusca* Flot., in Hepp, Flecht. Eur., n. 268. 1857.

*Lecidea fusca*  $\beta$  *atrofusca* (Flot.) T. Fries, Lich. Scand. II, p. 436. 1874.

Thallus usually thick, of scattered to compacted and more or less fused, minute to small, whitish to grayish or greenish-gray verrucules. I . KOH-. Apothecia  $0.5-1$  (2) mm. wide, adnate or somewhat constricted below, the disk plane or slightly to occasionally strongly convex, reddish-brown or more commonly brown-black or black, bare, the margin at first thin, rarely thick, in age thinning and usually disappearing. Hypothecium above moderately dark reddish- or yellowish-brown, below usually paler, sometimes with embedded black granules, the hyphae  $3-10\mu$  in diameter, with wide lumina, conglutinate, irregularly arranged or vertically arranged above in a layer up to  $80\mu$  thick. Exciple arising from the hypothecium, reddish-brown throughout or externally somewhat darker, in vertical section appearing decidedly pseudoparenchymatous, the hyphae up to  $8\mu$  in diameter, with lumina  $3-7\mu$  wide and up to  $13\mu$  long, the cross walls conspicuous, radially arranged, conglutinate. Hymenium nearly hyaline to pale reddish-brown, often darker above,  $55-70\mu$  thick, with or without embedded granules, the paraphyses coherent, the tips often brownish and enlarged to a diameter of  $3-8\mu$ . Spores hyaline, non-septate, oblong-ellipsoid to ellipsoid or subfusiform,  $10-13$  ( $16$ )  $\times$   $3.5-5\mu$ .

On moss and soil, Newcomb, 4104; Warrensburg, 5714, 5931, 5948; Ausable Lake and West Fort Ann (in the Farlow Herbarium); widely distributed in North America and in Europe.



This species has not been clearly defined by American or European lichenists. It is closely related to *L. fusca*, which differs in the prosenchymatous character of the exciple in vertical section, in the poorer development of the thallus, and in the slender or only slightly enlarged tips of the paraphyses. *L. atrofusca*, as represented by the excellent specimen, Hepp, Flecht. Eur. n. 268 (in the Farlow Herbarium), has a distinctly pseudo-parenchymatous exciple in vertical section, and can hardly be a variety of *L. fusca*, as considered by T. Fries and Vainio. Granules, said to be lacking in the hymenium of *L. Berengeriana* by these authors, are frequently present, and are also to be found in such closely related species as *L. fusca*, *L. Diapensiae*, and *L. delincta*, and in a quite unrelated species, *L. limosa*. Their occurrence then, is not a specific character.

31. *LECIDEA FUSCA* (Schaer.) T. Fries, Lich. Scand.  
II, p. 435. 1874.

*Lecidea sphaeriodes* & *fusca* Schaer., Lich. Helv. Spic. IV, p. 166. 1833.

Thallus absent or thin, membranous, or granulose with scattered to crowded, minute (about 0.1–0.15 mm. wide) granules, whitish or grayish to grayish-green, non-sorediate, I–, KOH–. Apothecia 0.5–1.2 mm. wide, adnate to moderately constricted below, the disk plane to strongly convex, pale brown, reddish-brown, or brown-black to black, bare, the margin more or less concolorous, variable in thickness, persistent or disappearing. Hypothecium usually reddish-brown to brown-black above, often with black granules, paler below, the color mostly in the interstices of the hyphae which are irregularly arranged, conglutinate or slightly carbonized above and marginally, more highly conglutinate below. Exciple arising as a radial extension of the hypothecium, reddish-brown, the hyphae up to 5 $\mu$  in diameter, with inconspicuous lumina, conglutinate or varying towards slightly carbonaceous. Hymenium hyaline or nearly so or yellowish-brown above, sometimes with embedded black granules, 70–80 $\mu$  thick, the paraphyses coherent, slender or slightly enlarged above. Spores hyaline, non-septate or becoming in part 1-septate, ellipsoid, 10–14 $\times$ 3–5 $\mu$ .

Var. *SANGUINEOATRA* (Nyl.) T. Fries, l.c.

*Lecidea sanguineoatra* Nyl., Not. ur Sällsk. Fauna et Flora Fenn. Förh., Häft. 5, p. 199. 1861 (not *Lichen sanguineoater* Wulf. in Jacq., Collect. III, p. 117. 1789).

Disk soon or eventually convex, the margin thin and disappearing. Spores non-septate.

On mosses over bark, Seventh Lake, 6107, and Newcomb, 3989 and 4021; not known elsewhere in North America; reported by Zahlbruckner to occur throughout the Northern Hemisphere. Most of the numerous American specimens under this name in herbaria should be referred to *L. Berengeriana*.

Var. *TEMPLETONI* (Tayl.) Vain., Arkiv f. Bot. 8<sup>1</sup>: 121. 1909.

*Lecidea Templetoni* Tayl., in Mackay, Fl. Hibern. II, p. 123. 1836.

Apothecia persistently plane and marginate or varying to convex and immarginate. Spores in part 1-septate.

On moss, Seventh Lake, 4497; reported elsewhere from Ireland, England, and the Scandinavian countries.

32. *LECIDEA DIAPENSIAE* T. Fries, Act. Reg. Soc. Scient.

Upsala, Ser. 3, 3: 209. 1860.

Thallus absent or rarely thin, membranous to subverruculose, white. Apothecia usually 0.4–0.8 mm. wide, but sometimes up to 2.1 mm., adnate to strongly constricted below, the disk slightly concave to plane or occasionally strongly convex, brown-black to black or sometimes paler, olivaceous-brown or reddish-brown, non-pruinose, the margin at first usually distinct and rather conspicuous, thinning but usually persistent in age. Hypothecium olivaceous- or reddish-brown and often tinged with bluish-black or black, the hyphae sometimes somewhat nodulose, 3–9 $\mu$  in diameter, irregularly arranged, gelatinized or conglutinate. Exciple arising from the hypothecium, pale to dark reddish-brown or blackish, except that all or part of the apical cells are hyaline, in KOH brighter and often with a violaceous tint, the hyphae 3–10 $\mu$  in diameter, radially arranged, gelatinized or conglutinate. Hymenium some shade of brown above, the lower part becoming concolorous with the hypothecium, in KOH paler and brighter and occasionally with granular matter dissolving to form bright blue spots, 60–70 (90) $\mu$  thick, usually with an upper hyaline cover up to 6 $\mu$  thick, the paraphyses coherent, in KOH moderately coherent to rather easily separable, simple or 1–2 branched or rarely somewhat net-like, 1.5–2 (2.5) $\mu$  in diameter, sometimes enlarged to 2.5–4 (5) $\mu$  above. Spores hyaline, non-septate or in part 1-septate, oblong to oblong-ellipsoid, 11–16 (19)  $\times$  3.5–5 $\mu$ .

On *Diapensia*, sometimes growing out from it to peaty soil, Mt. Marcy, elev. 5200 ft., 3134, 4214; known from the White Mountains, and reported by Zahlbruckner from the northern regions of the world.

The author of this species considered it a true parasite on *Diapensia*. As pointed out by Vainio (Act. Soc. pro Fauna Flora Fenn. 57<sup>2</sup>: 364. 1934), a pyrenomycete often grows on *Diapensia* along with the lichen. If this lichen is not parasitic, the septation of the spores, a rather constant character in American and European material (though unnoted by European writers), indicates that it is doubtfully distinct from *L. fusca* var. *Templetoni*.

33. *LECIDEA ALBOFUSCESCENS* Nyl., Flora 50: 370. 1867.

*Biatora peliaspis* Tuck., Proc. Amer. Acad. Arts and Sci. 12: 179. 1877.

Thallus absent or varying from a thin and membranous crust to subverruculose or verruculose, the verrucules 0.1–0.3 mm. wide, white or greenish-white, rarely soresiate, I–, KOH–. Apothecia usually solitary, 0.3–0.8 mm. wide, adnate or varying to rather strongly constricted below, the disk at first plane or slightly convex, becoming moderately to occasionally strongly convex, pale brown or more commonly dark reddish-brown, dark brown, or brown-black, usually bare but sometimes strongly pruinose, the margin often at first thick and conspicuous, dark, thinning, usually persisting but sometimes disappearing. Hypothecium reddish-brown, or brown to brown-black, homogeneous or often with a dark basal layer, the hyphae about 2–4 $\mu$  in diameter, usually vertically arranged above, conglutinate or more or less carbonized. Exciple a radial extension of the hypothecium or arising from the basal dark layer of the hypothecium, usually hyaline or pale brownish externally, within becoming concolorous with the hypothecium, the color often in the radial interstices of the hyphae which are somewhat indistinct, apparently up to 6 $\mu$  in diameter, with distinct slender lumina, radially arranged, usually gelatinized or rarely immersed in a gelatinized matrix. Hymenium more or less brown above, hyaline or nearly so below, 50–55 $\mu$  thick, the paraphyses usually gelatinized, coherent, 1.5–2.5 $\mu$  in diameter or enlarged to 5 $\mu$  above, and often brownish. Spores hyaline, non-septate, ellipsoid to subfusiform, 8–13 $\times$ 3–5 $\mu$ .

On bark and old wood, Mt. Marcy, 4600–4900 ft. elev., 3180, 3221, 3315; known elsewhere from Newfoundland to Florida and in Minnesota; reported from Europe as well.

The description and synonymy given above is based in part on a study of the original material of *L. peliaspis* in Tuckerman's Herbarium.

34. *LECIDEA DELINCTA* Nyl., Flora 55: 356. 1872.

Thallus thin to moderately thick, membranous to somewhat thickened and subverruculose, or varying to scurfy, usually gray-green, or olivaceous, I–, KOH–. Apothecia 0.2–0.5 (0.9) mm. wide, adnate to moderately constricted below, the disk at first slightly depressed to plane or slightly convex, becoming plane to strongly convex, brown-black to black or occasionally reddish-brown, bare, the margin usually at first thick, becoming thin and sometimes disappearing. Hypothecium varying from pinkish-brown through reddish-brown to brown-black, or with an olivaceous-black or blue-black color above, with black granules sometimes present, occasionally appearing pseudoparenchymatous, the hyphae irregularly arranged or vertically arranged in an upper layer to a thickness of 60 $\mu$ , conglutinate or somewhat carbonized. Exciple arising from the hypothe-



cium or distinct from it, pale or hyaline externally, usually concolorous with the hypothecium within, distinctly pseudoparenchymatous, the hyphae radially arranged, conglutinate or partially carbonized, with lumina  $2-8\mu$  wide and up to  $11\mu$  between the prominent crosswalls. Hymenium pale or olivaceous- or yellowish-brown above,  $60-80\mu$  thick, the paraphyses usually rather coherent in KOH,  $1-2.5\mu$  in diameter or rarely thickened to  $5\mu$  above. Spores hyaline, non-septate, ellipsoid to subfusiform,  $11-14 \times 5-6\mu$ .

On rocks, Chapel Pond, 5189; Marcy Brook, 6363, 6396; Newcomb, 4005, 4037, 4555, 4565, 4853, 5015; North Creek, 5154; 5175; Warrensburg, 5679, 5816, 5818, 5904; reported elsewhere from Europe. As no herbarium specimens of this species have been seen, these collections were named from the descriptions of *L. delincta* given by T. Fries and Vainio. From these the plants cited above differ in that the hypothecium and exciple do not show any distinct violaceous shades. Var. *leptophyllina* Vain. and var. *subverruculosa* Nyl. appear to be represented in these collections.

35. *Lecidea nemoralis* sp. nov.

Pl. II, Fig. 2.

Thallus tenuis, membranaceus aut membranaceo-areolatus, cinereo-virescens, nec KOH, nec I reagens. Apothecia  $0.3-1$  mm. lata, adnata, disco leviter vel modice convexo, atro, nudo, demum immarginata. Hypothecium obscure aeruginoso-nigricans. Excipulum cum hypothecio confluent, sed extus pallidum ad  $25\mu$  crassum. Hymenium superne olivaceofuscum,  $60-70\mu$  crassum, paraphysibus cohaerentibus, gracilibus aut superne leviter incrassatis. Sporae incoloratae, simplices, octonae, ellipsoideae,  $12-16 \times 5-8\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Newcomb, New York, J. L. Lowe n. 5016.

Thallus thin, membranous to membranous-areolate, greenish-gray, KOH-, I-. Apothecia  $0.3-1$  mm. wide, adnate, the disk at first slightly convex, becoming moderately to strongly convex, black, bare, the margin very thin and finally disappearing. Hypothecium dark greenish-black, KOH-, I-, the hyphae  $3-8\mu$  in diameter with narrow lumina, radially arranged except in the lower portion, conglutinate. Exciple well developed but poorly delimited, confluent with the hypothecium except for an outer pale part which reaches a thickness of  $25\mu$ , the hyphae  $4-5$  ( $8$ )  $\mu$  in diameter with lumina  $1-1.5\mu$  wide, radially arranged, conglutinate. Hymenium olivaceous-brown above, hyaline below, KOH-, I dark blue, becoming sordid reddish-brown,  $60-70\mu$  thick, the paraphyses coherent, simple or  $1-3$  times branched,  $1.5\mu$  in diameter or above sometimes enlarged to  $2.5\mu$ . Spores hyaline, non-septate, 8 in an ascus, ellipsoid,  $12-16 \times 5-8\mu$ . Algal cells green or yellowish-green, oval to subglobose,  $5-17\mu$  in diameter; no autospores seen.

On rocks in open woods, Newcomb, 5009, 5013, 5016 (type); not known elsewhere. *L. delincta* is quite similar but differs from this species most noticeably in the color of the hypothecium, which is usually brown.

36. *LECIDEA VIRGINIENSIS* Calk. et Nyl. in Millsp. et Nutt., Bot. Gaz.

22: 333. 1896.

*Lecidea albonigra* H. Magn., Med. f. Göteb. Bot. Trädg. 10: 26. 1936.

Thallus thin to moderately thick, white or grayish or greenish-white, verrucose or more commonly areolate, the verrucules or areoles about 0.1–0.3 mm. wide, I–, KOH–. Hypothallus thin and black, but usually absent. Apothecia 0.2–0.5 mm. wide, adnate to moderately constricted below, the disk at first slightly depressed to plane or slightly convex, becoming plane to moderately convex, pale brown to brown-black or black, bare, the margin at first variable in thickness, becoming thin and often disappearing. Hypothecium pale to dark yellowish- or reddish-brown, the hyphae 2.5–4 $\mu$  in diameter, with moderately thick to thick walls, sometimes vertically arranged above. Exciple usually arising from the hypothecium or moderately distinct from it, externally more or less brown, paler within, the hyphae 4–6 $\mu$  in diameter, with narrow lumina, radially arranged, conglutinate. Hymenium more or less olivaceous-brown above, 55–70 $\mu$  thick, the paraphyses usually somewhat coherent, simple or 1–2 branched, 1.5–2.5 $\mu$  in diameter, sometimes brownish and enlarged above to 2–5 $\mu$ . Spores hyaline, non-septate, oblong-ellipsoid to ellipsoid, 8–13  $\times$  3.5–5 (6.5) $\mu$ .

On rock, Avalanche Pass, 6149, 6151; Marcy Brook, 2663 (type of *L. albonigra*), 6284, 6285, 6322, 6339, 6342, 6369, 6371, 6375, 6378, Newcomb, 3986, 4830; Warrensburg, 5905; known elsewhere from West Virginia (from a study of part of the original collection of *L. virginiensis* in the Herbarium of the University of Michigan). The relationship of this species to other species of *Lecidea* is still uncertain. The thickness of the hymenium and the nature of the paraphyses suggest a relationship to *L. fusca*, but the structure of the exciple is similar to that of *L. plebeja*.

6b. Spores rarely exceeding 10 $\mu$  long.

37. *LECIDEA MYRIOCARPOIDES* Nyl., Flora 48: 355. 1865.

Thallus usually absent or indicated by whitened areas of the substratum, or sometimes with olivaceous or olivaceous-brown, minute (about 0.05–0.1 mm. wide), fused or discrete granules, or membranous, the last I–, KOH with a slight brown stain. Apothecia 0.3–0.5 mm. wide, adnate, the disk at first plane, becoming slightly to moderately or rarely strongly convex, dark reddish- or yellowish-brown to brown-black or black, bare, the margin at first rather thick, usually persistent but sometimes disappearing. Hypothecium dark yellowish- or reddish-brown to brown-black,

scarcely altering in KOH, the hyphae  $2.3.5 (5)\mu$  in diameter, with moderately narrow lumina, closely interwoven, conglutinate-carbonized. Exciple usually paler externally, otherwise more or less concolorous and intergrading with the lower part of the hypothecium, unchanged or losing reddish tints in KOH, the hyphae  $2.5-5 (8)\mu$  in diameter, with wide lumina, radially arranged, somewhat conglutinate toward the tips. Hymenium some shade of brown above, pale to hyaline below,  $45-55\mu$  thick, the paraphyses coherent,  $2.5-5\mu$  in diameter or often colored and enlarged to  $2.5-5\mu$  above. Spores hyaline, non-septate or sometimes becoming 1-septate, ellipsoid,  $6-8 (10) \times 2.5-3.5 (4.5)\mu$ .

On decorticate wood, Newcomb, 6063; Warrensburg, 5640, 5648, 5684, 5770, 5787, 5811, 5972; known from Maine to South Carolina and in Kentucky and Ohio.

Vainio (Act. Soc. pro Fauna Flora Fenn. 57<sup>2</sup>: 239, 243) describes this species from the type specimen in Nylander's herbarium, and states that the hypothecium is purple and gives off a subpurple stain in KOH, and also that the epithecium becomes purple. Mostly on account of this reaction to KOH, he places *L. myriocarpoides* in synonymy with *L. enclitica* Nyl. In that part of the original collection which is in Tuckerman's herbarium (n. 140), the hypothecium and epithecium do not react to KOH, and the spores do not reach the length ( $8-14\mu$ ) described for *L. enclitica*. This species seems closely related to *L. plebeja*, which differs principally in a decided reaction to KOH, the hypothecium turning to an intense olivaceous-yellow color in the upper part of the hypothecium.

38. LECIDEA CYRTIDEA Tuck., Proc. Amer. Acad. Arts and Sci.,  
12: 181. 1877.

Thallus absent or thin and inconspicuous, smooth and continuous or occasionally minutely thickened and minutely rimulose or rarely with minute verrucules compacted into a thin, furrowed crust, pale to dark olive-brown, KOH-, I-. Apothecia 0.2-0.5 (0.6) mm. wide, adnate or sometimes slightly constricted below, the disk plane to convex, dark brown to black, bare, the margin at first of variable thickness, becoming thinner and sometimes disappearing. Hypothecium brown-black or dark brown or rarely purplish-brown, the hyphae  $3.5\mu$  in diameter, sometimes vertically arranged in an upper layer  $15-30\mu$  thick, carbonized. Exciple varying from subhyaline to olivaceous-brown or slightly darker within, concolorous or more often darker externally, the hyphae  $2.5-4.5\mu$  in diameter, usually dark and enlarged to  $4-8\mu$  at the tips, with moderately narrow lumina, radially arranged, somewhat conglutinate. Hymenium olivaceous to dark brown above, hyaline or pale brown below,  $30-50\mu$  high, the paraphyses coherent, about  $2-2.5\mu$  in diameter, or brown and enlarged to  $5\mu$  above. Spores hyaline, non-septate, ellipsoid,  $6-8 \times 2.5-3.5\mu$ .



On rocks, rarely on bark, not yet known from the Adirondacks but within the known range of the species, which is from Maine to South Carolina and westward to Missouri and Minnesota. The description given above is based in part on a study of the two original collections in Tuckerman's Herbarium. This species is endemic to North America so far as known, unless the European species *L. lapillicola* Vain. be considered a synonym, as Magnusson (Med. f. Göteb. Bot. Trädg. 10: 23. 1936) has suggested. In the latter species the paraphyses are described by Vainio as not being clavate at the tips, thus differing decidedly from the paraphyses in *L. cyrtidea*. *L. plebeja* is very similar, and may eventually be considered synonymous with it, but the hypothecium is paler with conglutinate hyphae and it occurs only on a wood substratum.

39. *LECIDEA PLEBEJA* Nyl., Flora 48: 148. 1865.

Thallus usually indicated by whitening of the substratum, sometimes with a distinct white hypothallus, or with a very thin olivaceous or grayish-green crust of compacted granules. Apothecia 0.2–0.5 mm. wide, adnate, the disk at first plane to moderately convex, black, bare, the margin usually at first distinct, black, thinning and often disappearing. Hypothecium usually olivaceous-brown, varying to pale brown or reddish-brown, in KOH the upper part suffused with a distinct olivaceous stain, the hyphae (2.5) 4–6 $\mu$  in diameter, usually with narrow lumina, irregularly arranged, conglutinate. Exciple continuous with the hypothecium, brown-black or dark reddish-brown above and paler externally, paler below, the color mostly in the interstices of the hyphae which are 4–8 $\mu$  in diameter, with wide lumina, often dark at the apices, conglutinate. Hymenium olivaceous- or yellowish-brown above, pale below but shading into the color of the hypothecium, 45–50 $\mu$  thick, the paraphyses coherent, 1.5–2 $\mu$  in diameter, usually brown and enlarged to 3–5 $\mu$  above. Spores hyaline, non-septate, narrowly ellipsoid or subfusiform, 6.5–8  $\times$  2.5–3 $\mu$ .

On old wood, Newcomb, 4973, 6043; and Warrensburg, 5786 and 5788; known elsewhere from Europe. This species is very closely related to *L. myriocarpoides*, which differs principally in the negative reaction of the hypothecium to KOH. The concept of *L. plebeja* presented here is based mostly on a study of Norrlin, Herb. Lich. Fenn. Fasc. IV, n. 173. 1875, in the Farlow Herbarium.

40. *LECIDEA BOTRYOSA* (E. Fries) T. Fries, Lich. Scand. II, p. 454. 1874.

*Biatora botryosa* E. Fries, Vet. Ak. Handl., p. 268. 1822.

Thallus usually well developed, verruculose, the verrucules 0.1–0.3 mm. wide, compact, clustered or scattered, usually grayish-brown, or where shaded paler to greenish-white or grayish-white to white, sometimes breaking up to form soredia, I–, KOH–. Apothecia solitary or often clus-

tered, 0.2–0.4 mm. wide, varying from adnate to moderately constricted below, the disk plane or sometimes strongly convex, reddish-brown or more commonly dark brown to black, bare or rarely white-pruinose, the margin usually quite thick at first, paler than the disk, becoming thinner but persisting. Hypothecium brown-black or paler and often with a reddish tinge, the hyphae  $2.5-5\mu$  in diameter, with walls of variable thickness, irregularly arranged or vertically arranged, carbonized. Exciple usually distinct from the hypothecium, dark brown or dark yellowish-brown externally and pale brownish within, the color mostly in the radial interstices of the hyphae which are  $3-6 (10)\mu$  in diameter, with wide to narrow lumina, conglutinate, the tips often dark. Hymenium some shade of brown above, paler to hyaline below,  $50-60\mu$  thick, the paraphyses coherent or moderately separable,  $1.5-2.5\mu$  in diameter, sometimes enlarged to  $6\mu$  above, brown. Spores hyaline, non-septate, oblong to ellipsoid, or occasionally subfusiform,  $7-12 \times 2.5-4.5 (5)\mu$ .

On old wood, especially charred wood, Chapel Pond, 5480, 5481, 5536, 5553; Newcomb, 4848, 4975, 6015, 6016, 6032; Warrensburg, 3604, 5634, 5638, 5641, 5645, 5647, 5682, 5767, 5795, 5875; known also from New Hampshire and somewhat doubtfully from California and the Vancouver Islands (in the Farlow Herbarium); reported elsewhere from northern Europe and Asia.

The determinations given above are based on a comparison with No. 219 of Lich. Suec., issued by E. Fries, the author of this species. The exsiccatae specimen is in the Farlow Herbarium.

5b. Hymenium some shade of bluish- or greenish-black to black above, at least in KOH

6a. Spores  $3-6\mu$  wide

#### 41. *LECIDEA PYCNOCARPA* (Koerb.) Ohlert, Schrift. Königl.

Phys.-Ökonom. Ges. Königsb. 11: 15. (1870) 1871.

*Lecidella pycnocarpa* Koerb., Par. Lich., 3. Lief. p. 213. 1861.

Thallus thick, verrucose or compacted areolate-verrucose, whitish or grayish-white to olivaceous-grayish, the verrucules loosely attached, 0.1–0.2 mm. wide, I–, KOH yellow or more rarely–. Apothecia densely conglomerate and often proliferate, rarely solitary, 0.1–0.25 mm. wide or when solitary up to 0.3 mm. wide, the disk slightly concave to plane at first, becoming plane to slightly convex, black, bare, the margin often concolorous, thick in young apothecia, becoming thinner, persistent or disappearing. Hypothecium pale brown to dark brown or dark reddish-brown, the hyphae  $2.5-3\mu$  in diameter, with thin to moderately thick walls, sometimes vertically arranged above, carbonized. Exciple reddish-brown or some shade of brown, the hyphae  $4-8\mu$  in diameter, with narrow or moderately narrow lumina, radially arranged, highly gelatinized. Hymenium

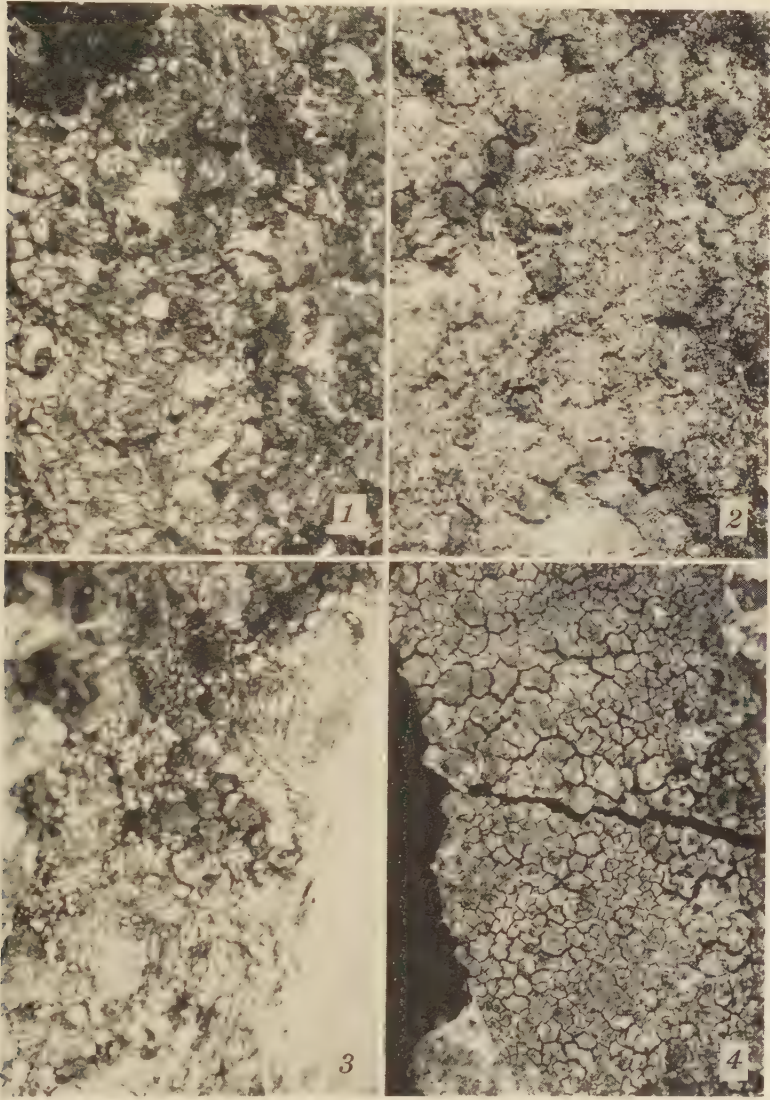


PLATE II. Habit of type specimens of certain species of *Lecidea*, all  $\times 8$ . Fig. 1. *Lecidea columnata*. Fig. 2. *Lecidea nemoralis*. Fig. 3. *Lecidea marciensis*. Fig. 4. *Lecidea humilis*.

dark bluish-black or olivaceous-black above, hyaline or pale bluish-black below,  $50-60\mu$  high, the paraphyses coherent,  $1.5-2$  ( $2.5$ ) $\mu$  in diameter, sometimes enlarged to  $2-3.5\mu$  above. Spores hyaline, non-septate, oblong to oblong-ellipsoid,  $10-14$  ( $17$ ) $\times 4-5.5$  ( $6$ ) $\mu$ .

On rocks, Mt. Marcy, 2631, 2921 (det. A. H. Magnusson); known from



Grand Manan Island, New Brunswick, Canada, and reported from Europe.

42. *Lecidea marciensis* sp. nov.

Pl. II, Fig. 3.

Thallus modice crassus, cinereo-albicans vel albus, verrucosus, nec KOH, nec I reagens. Apothecia dense conglomerata et frequenter proliferata, rare solitaria, 0.15–0.3 mm. lata, aut solitaria ad 0.5 mm. lata, adnata vel rare sessilia, disco demum plano, atro, nudo, margine demum tenui. Hypothecium fulvum aut olivaceo-fuscum aut fusco-nigrum. Excipulum superne obscure aeruginoso-nigricans, inferne nigricans aut purpureo-nigricans. Hymenium superne intense aeruginoso-nigricans aut nigricans, 50–60 (70) $\mu$  crassum, paraphysibus sat gracilibus. Sporae incoloratae, simplices, octonae, oblongo-ellipsoideae vel ellipsoideae aut subfusiformae, 8–14 $\times$ 3–6 $\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum in Mt. Marcy prope Lake Placid, New York, J. L. Lowe n. 4299.

Thallus moderately thick, grayish-white to white, verrucose, the verrucules dispersed or contiguous, convex, firmly attached, 0.1–0.4 mm. across, I–, KOH–. Apothecia densely conglomerate and frequently proliferate, rarely contiguous or solitary, 0.15–0.3 mm. wide, or in solitary apothecia up to 0.5 mm. wide, adnate or rarely sessile, the disk usually depressed at first, becoming plane, black, bare, the margin at first thick, becoming thinner but persisting. Hypothecium yellowish- or olivaceous-brown, or brown-black, I–, KOH–, the hyphae 2–2.5 $\mu$  in diameter and with moderately wide lumina, usually irregularly arranged throughout, partly carbonized and the color mostly in the walls of the hyphae. Exciple distinct from the hypothecium, dark greenish-black above, changing to blackish or purplish-black below, I–, KOH–, the hyphae 3–6 $\mu$  in diameter, with wide lumina, conglomerate. Hymenium intensely greenish-black or black above, paler to nearly hyaline below, in KOH the color more intense, I blue, usually becoming sordid olivaceous and the asci often reddish-brown, 50–60 (70) $\mu$  thick, the paraphyses moderately coherent, in KOH readily separating, simple or 1–2 branched, 1.5–2 $\mu$  in diameter. Spores hyaline, non-septate, 8 in an ascus, oblong-ellipsoid to ellipsoid or subfusiform, 8–14 $\times$ 3–6 $\mu$ . Conidangium or conidia not found. Algal cells green or yellowish-green, oblong to oval or subglobose, 5–13 $\mu$  in the long diameter; autospores not seen.

On rocks, Mt. Marcy (elev. 4900 ft.), 4299 (type); Mt. Colden (elev. 3500–4600 ft.), 6175, 6179, 6185, 6193, 6213, 6245, 6248, 6256; not known elsewhere.

*L. pycnocarpa*, although quite similar in external appearance, has loosely attached verrucules, a brown exciple, and a hypothecium of the reddish shades of brown. *L. conferenda* f. *moriformis* T. Fries, judging from Fries'

and Vainio's descriptions, is similar, but differs in the much thinner, dispersed or obsolete thallus, in the tuberculate arrangement of the apothecia, and in the hypothecium which is colorless throughout or subviolaceous above.

43. *Lecidea humilis* sp. nov.

Pl. II, Fig. 4.

Thallus modice tenuis, cinereo-nigricans aut saepe rufescens, areolatus, areolae planae, 0.1–0.4 mm. latae, nec I, nec KOH reagens. Hypothallus tenuis, niger, saepius secundum marginem thalli. Apothecia 0.3–0.6 mm. lata, primum immersa, demum emergentia et adnata, aut partim liberata, thallo se retrahenti, disco primum plano, demum modice convexo, intense rufo-fusco aut fusco-nigro, nudo, nitido, primum immarginata, demum tenuiter marginata, margine olivaceo-fusco, pallidiore quam disco. Hypothecium intense rufo-fusum, hyphis verticaliter dispositis, 4–5 $\mu$  crassis. Excipulum saepe parum evolutum tenuissimumque, indistincte pseudoparenchymaticum, superne olivaceo- aut aeruginoso-nigricans, inferne pallidum, hyphis 2–3 $\mu$  crassis, pluribus membranis transversis. Hymenium superne modice olivaceo-virescens, 55–65 $\mu$  crassum, paraphysibus cohaerentibus. Sporae incoloratae, simplices, octonae, oblongae aut ellipsoideae, 8–12 $\times$ 4–6 $\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Lake Placid, New York, J. L. Lowe, n. 6338.

Thallus quite thin, grayish-black or often stained reddish, areolate, the areoles 0.1–0.4 mm. wide, plane, I–, KOH–. Hypothallus thin, black, usually delimiting the thallus. Apothecia 0.3–0.6 mm. wide, at first immersed, after a long time emerging and becoming adnate and in part freed by the thallus breaking away, the disk at first plane, becoming moderately convex, dark reddish-brown to brown-black, bare, shiny, at first immarginate but at maturity thinly marginate, the margin olivaceous, paler than the disk. Hypothecium dark reddish-brown, KOH , I blue in an upper layer 25–40 $\mu$  thick, unchanged below, the hyphae 4–5 $\mu$  in diameter and apparently with thin walls, vertically arranged throughout, conglutinate-carbonized. Exciple often poorly developed and very thin, arising from the external portion of the hypothecium, indistinctly pseudoparenchymatous, olivaceous- or greenish-black along the side of the hymenium, pallid below, the hyphae 2–3 $\mu$  in diameter, with wide lumina and numerous, inconspicuous cross-walls. Hymenium moderately olivaceous-green above, hyaline below, KOH , I blue then the upper 40 $\mu$  reddish-brown, and the lower part sordid olivaceous-blue, 55–65 $\mu$  thick, the paraphyses embedded in abundant hymenial jelly, coherent, about 2 $\mu$  in diameter, sometimes slightly enlarged above to 2.5 $\mu$ . Asci narrowly clavate. Spores hyaline, non-septate, 8 in an ascus, oblong to ellipsoid, 8–12 $\times$ 4–6 $\mu$ . Algal cells green, oval to globose, 5–11 $\mu$  in diameter; autospores frequently formed.

On rock in a brook bed, Marcy Brook near Lake Placid, at 2600 ft. elev., n. 6338 (type); not known elsewhere. This species is of uncertain relationship.

44. *LECIDEA CRASSIPES* (T. Fries) Nyl., *Flora* **45**: 464. 1862.

*Helocarpon crassipes* T. Fries, *Act. Reg. Soc. Scient. Upsal.*, ser. 3, **3**: 178. 1860.

Thallus thin to well-developed, white or greenish-white, granular to subcoralloid, the granules about 0.1 mm. wide, KOH-, I-. Apothecia usually solitary, sometimes conglomerate, 0.3-1 mm. wide, the base constricted below to form a short stipe immersed between the granules, the disk at first plane to slightly convex, becoming slightly to strongly convex, black or rarely at first reddish-brown, bare, the margin at first rather thick, thinning and often disappearing, usually concolorous but sometimes paler, at least at first. Hypothecium brown-black or greenish-black above, opaque, more or less purplish-black below, the color in the interstices of the hyphae which are 1.5-2 $\mu$  in diameter and vertically arranged in an upper layer 25-50 $\mu$  thick, below 7-11 $\mu$  in diameter with narrow lumina, highly conglutinate, the dark interstitial material forming a distinctive pattern. Exciple continuous with the lower part of the hypothecium, pale brownish or with a bluish-black tint externally, the hyphae 1.5-2 $\mu$  in diameter, radially arranged, either gelatinized or imbedded in a gelatinous matrix. Hymenium more or less olivaceous-brown above, pallid below, KOH usually more or less greenish-black above, 40-60 $\mu$  thick, the paraphyses coherent, 1.5-2 $\mu$  in diameter. Spores hyaline, non-septate or rarely in part becoming 1-3 septate, oblong to oblong-ellipsoid or subfusiform, 10-13 (16)  $\times$  3-5 (5.5) $\mu$ .

On moss, Mt. Marcy, 2626, 2637, 2748, 2949, 3002, 3007, 3008, 3089, 3186, 3209, 4216, 4283; Avalanche Lake, 6146; Mt. MacIntyre, 3834; reported from Arctic America and from the mountainous regions of Europe. This species is very similar in structure to *Bilimbia melaena* (Nyl.) Arn. and the spores are of similar size, and sometimes show a tendency to septation like that in the genus *Bilimbia*. *L. assimilata* Nyl. differs in not forming a stipe-like structure on the lower part of the apothecium.

45. *LECIDEA BRUNNEOFUSCA* H. Magn., *Med. f.*

Göteb. Bot. Trädg. **10**: 19. 1936.

Thallus moderately thick, grayish-brown or chestnut-brown, areolate or squamulose-areolate, the margins frequently black, KOH-, I medulla blue. Hypothallus sometimes prominent, black. Apothecia 0.4-1 mm. wide, arising on the areoles, subimmersed to adnate, the disk plane to strongly convex, black, bare, the margin at first thin, persisting or disappearing. Hypothecium reddish-brown to purplish-brown, the hyphae 3-5 $\mu$  in



diameter, the walls carbonizing and the lumina becoming small, more or less radially arranged. Exciple arising from the outer part of the hypothecium, sometimes poorly developed, above greenish-black externally and paler to nearly hyaline within, below changing to brown externally, the hyphae  $3.5\text{--}5\mu$  in diameter, with moderately narrow lumina, cross walls frequent but not conspicuous and the tissue not appearing pseudo-parenchymatous, conglutinate-fragile. Hymenium greenish- or bluish-black above, more or less blue below,  $60\text{--}80\mu$  high, the paraphyses fragmenting, coherent to moderately separable in KOH,  $2\text{--}3\mu$  in diameter, darker and enlarged to about  $5\mu$  above. Spores hyaline, non-septate, oblong-ellipsoid to ellipsoid,  $10\text{--}13$  ( $15$ )  $\times$   $4\text{--}6\mu$ .

On rocks, Chapel Pond, July 12, 1932 (type), 3370, 3757, 3761, 3762, 3763, 3765, 3799, 5544, 5617, 5618; Marcy Brook, 6297; Mt. Colden, 6124, 6187; Newcomb, 4075, 4821, 4877, 4889; Warrensburg, 5214, 5428, 5973, 5979; not known elsewhere.

In the original description Magnusson stated that this plant belongs to the group of species associated with *L. atrobrunnea* (Ram.) Schaer., and differs from this particular species "by the smaller, dusky brown, very uneven areolae, the thinner cortex, the darker hypothecium, another structure of the exciple and the absence of a distinct hypothallus." The inner structure is also quite similar to that of *L. auriculata* and *L. promiscens* Nyl.

46. *Lecidea furva* sp. nov.

Pl. III, Fig. 1.

Thallus sat tenuis, areolato-diffractus, areolae contiguae et subdiscretae, planae, nigricantes aut cinereo-nigricantes, albido-pruinosaе,  $0.2\text{--}0.3$  ( $0.5$ ) mm. latae, nec I, nec KOH reagens. Hypothallus nullus aut inconspicuus. Apothecia  $0.4\text{--}0.8$  mm. lata, primum immersa, demum adnata, disco leviter vel modice convexo, atro, nudo, margine demum tenui, persistente. Hypothecium rufo-fuscum aut partim violaceo-fuscum, hyphis plus minus verticaliter dispositis,  $4\text{--}5\mu$  crassis. Excipulum superne et extus aeruginoso-nigricans, intus pallidius, inferne intense violaceo-fuscum, hyphis circa  $5\mu$  crassis. Hymenium superne pallide aeruginoso-nigricans,  $50\mu$  crassum, paraphysibus sat tenuibus, articulatis. Sporae incoloratae, simplices, octonae, ellipsoideae vel late ellipsoideae,  $8\text{--}11 \times 4.5\text{--}6\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Lake Placid, New York, J. L. Lowe n. 6388.

Thallus quite thin, areolate-diffract, areoles contiguous or subdiscrete,  $0.2\text{--}0.3$  ( $0.5$ ) mm. wide, plane, black or grayish-black, whitish-pruinose, KOH-, I-. Hypothallus inconspicuous or absent. Apothecia  $0.4\text{--}0.8$  mm. wide, at first immersed, becoming adnate, the disk slightly to moderately convex, black, bare, the margin becoming thin but usually persisting. Hypothecium reddish-brown or in part violaceous-brown, KOH-, I- ex-

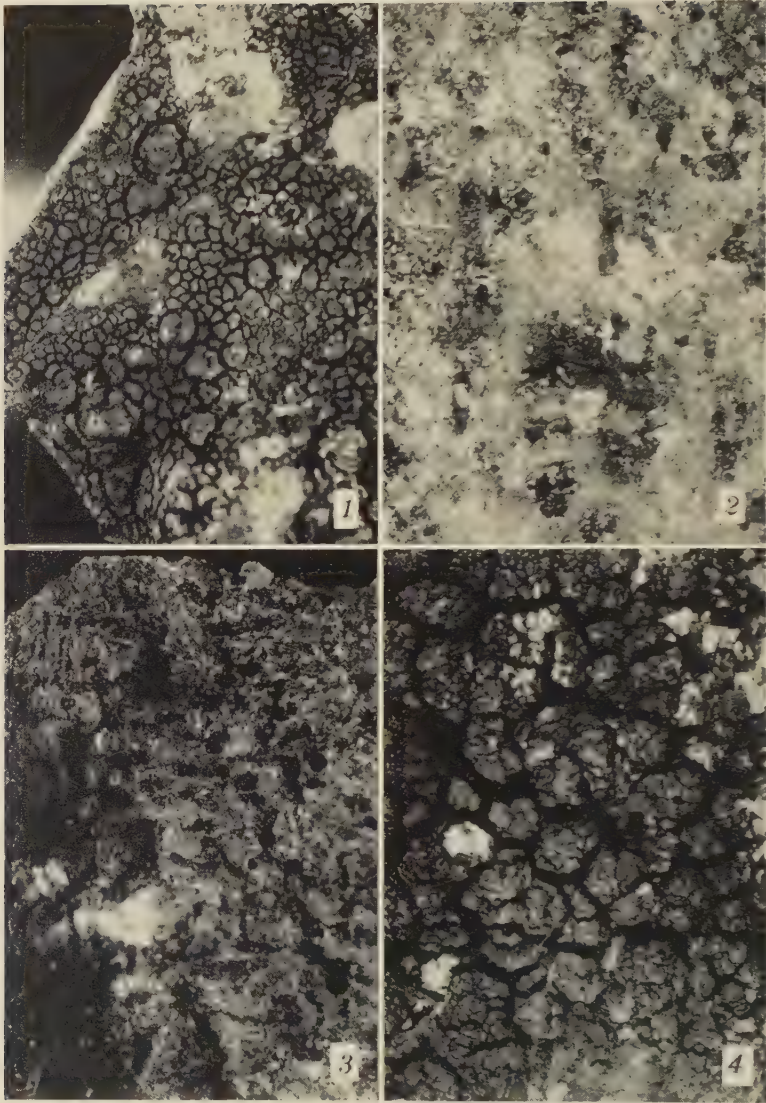


PLATE III. Habit of type specimens of certain species of *Lecidea*, all  $\times 8$ . Fig. 1. *Lecidea furva*. Fig. 2. *Lecidea suberratica*. Fig. 3. *Lecidea amniculensis*. Fig. 4. *Lecidea rugosa*.

cept the paler hyphae becoming blue and then yellowish-brown, the hyphae  $4-5\mu$  in diameter, with quite narrow lumina, vertically arranged more or less throughout, conglutinate-fragile. Exciple continuous with the hypothecium, externally greenish-black and paler within, below dark violet-brown, KOH-, I blue then in part yellowish-brown, the hyphae about  $5\mu$  in diameter, the lumina becoming narrow at least in the tips, radially

arranged, conglutinate-fragile. Hymenium pale greenish-black above, pale below, KOH-, I pale blue then at once reddish-brown,  $50\mu$  thick, the paraphyses fragmenting on crushing in KOH, externally apparently gelatinized, within firm, decidedly articulate, with frequent and conspicuous crosswalls. Spores hyaline, non-septate, 8 in an ascus, ellipsoid to broadly ellipsoid,  $8-11 \times 4.5-6\mu$ . Algal cells green or yellowish-green, oval to globose,  $8-20\mu$  in diameter; no autospores seen.

On rock along Marcy Brook near Lake Placid, 6388; not known elsewhere. *L. plumbeoatra* Vain. as described by Vainio, seems to be quite similar to this species but differs in having a gray thallus and in the hypothecium turning to a purple color in KOH.

6b. Spores  $5-11\mu$  wide

47. LECIDEA EUPHOREA (Floerk.) Nyl., Flora **64**: 187. 1881.

*Lecidea sabuletorum*  $\gamma$  *euphorea* Floerk., Gesellsch. Naturforsch. Freunde Berlin Mag. **2**: 311. 1808.

Thallus rather well developed, verruculose, the verrucules 0.1-0.4 mm. wide, scattered to contiguous or compacted and then sometimes the thallus areolate, white to grayish, or olivaceous or grayish-green, I-, KOH- or very slightly yellowish. Apothecia 0.3-1 mm. wide, adnate to moderately constricted below, the disk slightly depressed to plane, becoming slightly to strongly convex, black, bare, the margin black, thin, usually persisting. Hypothecium pale yellow to yellowish- or reddish-brown, the hyphae about  $5\mu$  in diameter, with wide lumina, vertically arranged or sometimes irregularly arranged below, conglutinate. Exciple sharply differentiated from the hypothecium by color and structure, olivaceous blue-black or reddish-brown externally and sometimes with a hyaline gelatinized cover  $10-15\mu$  thick, bright golden-brown within, the hyphae  $4-10\mu$  in diameter, with lumina variable in width, conglutinate. Hymenium olivaceous- or greenish-black above, in KOH more distinctly olivaceous above,  $80-110\mu$  thick, sometimes with included granular matter not soluble in KOH, the paraphyses rather coherent, in KOH readily separable,  $1-2\mu$  in diameter, enlarged to  $2.5-4\mu$  above and often dark. Spores hyaline, non-septate, broadly ellipsoid,  $11-16 \times 7-9\mu$ .

On wood and bark, Newcomb, 2926, 3984, 3999; Seventh Lake, 6108; reported from Europe, Asia, and North America. The specimens cited above seem to be intermediate between f. *achrista* (Smft.) Vain. and f. *Laureri* (Hepp) Vain.

This corticolous species is very similar to *L. latypea*, a species found on rock.

48. LECIDEA LATYPEA Ach., Meth. Suppl., p. 10. 1803.

Thallus well developed, thick, usually verruculose, the verrucules whitish to dark grayish, discrete or compacted, 0.1-0.4 mm. wide, or



sometimes the thallus cracking and becoming more or less areolate, I-, KOH-. Apothecia 0.4-1 mm. wide, adnate to moderately constricted below, the disk at first slightly depressed to plane, sometimes remaining depressed but usually becoming more or less convex, black or rarely brown-black, the margin at first rather thick, black, becoming thin but usually persisting. Hypothecium olivaceous- or yellowish- or reddish-brown, the hyphae usually more or less vertically arranged, conglutinate. Exciple sharply differentiated by color and structure from the hypothecium, above bright reddish- or yellowish-brown within and olivaceous-blackish or bluish-black externally, sometimes with granular matter, the hyphae 4-9 $\mu$  in diameter, usually with wide lumina, conglutinate. Hymenium intensely bluish-black above, hyaline below, in KOH somewhat olivaceous above, 80-120 $\mu$  thick, the paraphyses coherent, readily separable in KOH, about 2 $\mu$  in diameter or enlarged to 3-5 $\mu$  above, and darkened. Spores hyaline, non-septate, ellipsoid or broadly ellipsoid, 13-15  $\times$  7-11 $\mu$ .

On rock, Warrensburg, 5664, 5751, 5968, 5974; reported from the more temperate regions of the world. This species does not seem to differ morphologically from *L. euphorea*. It grows, however, on rock instead of on wood and bark, and is here kept separate following current European practice.

49. *LECIDEA CINEREORUFA* Schaer., Lich. Helv. Spic. III, p. 122. 1828.

*Psora cinereorufa* (Schaer.) Hellb., Oefvers. Kgl. Vetensk.-Akad. Förh., 32<sup>3</sup>: 63. 1875.

*Lecidea lugubris* E. Fries, Lich. Eur. Ref., p. 314. 1831 (not *Lecidea lugubris* Sommerf., Suppl. Flor. Lapon., p. 143. 1826).

Thallus squamulose, the squamules small, thin, sublobate, compacted into a verrucose-areolate or areolate-diffract crust with a grayish-brown and more or less shiny surface, dying away and blackening below, persisting to form an easily separable crust up to 2 mm. thick, KOH-, I-. Apothecia 0.4-0.7 mm. wide, adnate, the disk at first depressed, becoming plane, black, bare, the margin remaining rather thick. Hypothecium pale above, brownish to rather dark brown below, the hyphae 2.5-7 $\mu$  in diameter, with moderately wide lumina, irregularly arranged, conglutinate. Exciple distinct from the hypothecium, reddish-brown or dark brown or above becoming concolorous with the upper part of the hymenium, the hyphae 4-8 $\mu$  in diameter, the walls thin to moderately thick and becoming carbonized, radially arranged. Hymenium intensely greenish-black above, paler below, 100-170 $\mu$  thick, the paraphyses easily separable except for the coherent apices, 1.5-2 $\mu$  in diameter, often markedly constricted and articulate above, the apex enlarged to 3.5 $\mu$ . Spores hyaline, non-septate, subglobose to globose, 7-9 $\mu$  in diameter.

On rocks, Mt. Marcy, 2948, 4220, 4225, 4242, 4268, 4275, 4297; reported elsewhere from New Hampshire and from Europe.

50. *LECIDEA ATROCINEREA* (Schaer.) Vain., Act. Soc. F. Fl. Fenn. 57<sup>2</sup>: 244. 1934.*Urceolaria cinerea*  $\delta$  *atrocinerea* Schaer., Lich. Helv. Spic. II, p. 72. 1826.*Lecidea tenebrosa* Flot., in Zwackh, Lich. Exs. n. 134. 1852 (according to Vainio).

Thallus thin to moderately thick, grayish-black or grayish-brown, areolate-verrucose, the verrucules contiguous or discrete, 0.2–1 mm. wide, plane or convex above, I, KOH or very slightly yellowish or brownish. Apothecia solitary, 0.3–0.8 mm. wide, immersed in the areoles at first, emerging and becoming adnate, or the thallus breaking away, the disk at first depressed to plane, remaining plane, black, bare, the margin usually not visible until maturity, then thin, black. Hypothecium hyaline to more or less brownish, the hyphae 2.5–5 $\mu$  in diameter, with wide lumina, conglomerate or the walls sometimes moderately carbonized, radially arranged or sometimes irregularly arranged below. Exciple thick below the surface of the thallus, above thinner and sometimes nearly absent, brown-black or greenish-black or sometimes hyaline within in the upper part, below brown externally and hyaline within, the hyphae with brown parallel tips, within 4–5 $\mu$  in diameter, with thin walls, irregularly arranged except at the tips. Hymenium bluish-black or sometimes greenish- or olivaceous-black above, 90–130 $\mu$  thick, the paraphyses easily separable, 1.5–2.5 $\mu$  in diameter or sometimes enlarged to 3.5 $\mu$  above and frequently darkened. Spores hyaline, non-septate, oblong to ellipsoid and broadly ellipsoid, 11–14  $\times$  5–8 $\mu$ .

On rocks, Mt. Marcy, 2617, 2917 (det. A. H. Magnusson); known elsewhere from New Mexico, and reported from New Hampshire; and by Zahlbruckner from the Northern Hemisphere.

3b. Exciple hyaline or pale within, or lacking

51. *LECIDEA SCALARIS* Ach., Meth. Lich., p. 78. 1803.*Lichen scalaris* Ach., Vet. Ak. Handl., p. 127, tab. 5, f. 1. 1795.*Psora ostreata* Hoffm., Deutsch. Fl. II, p. 163. 1796.

Thallus squamulose, the squamules ascending, reniform, greenish-gray or varying toward brownish, the margin entire or somewhat crenulate, below usually white-soresediate, KOH-, I-. Apothecia seated on the squamules, 0.3–1 mm. wide, adnate, the disk usually remaining depressed to nearly plane, black, slightly bluish-pruinose to bare, the margin thick. Hypothecium pale to moderately reddish-brown, the hyphae 3–5 $\mu$  in diameter, with colored, moderately thin walls, irregularly arranged. Exciple intergrading with the lower part of the hypothecium, hyaline within, greenish-black above and brown below in the external part, with abundant granular material which dissolves at once in KOH, the hyphae 4–7 $\mu$  in diameter, with narrow lumina, articulate, radially somewhat loosely inter-

woven. Hymenium intensely greenish-black above, hyaline below, KOH clearing the olivaceous-brown granular matter, otherwise unchanged,  $50-60\mu$  thick, the paraphyses moderately separable, about  $1.5-2\mu$  in diameter. Spores, according to Nylander, oblong,  $11-12 \times 2.5-3.5\mu$ .

On old and especially on carbonized wood, Newcomb, 4680, 4754a, 4763, 5028, 5030, 5031a, 5066, 5068, 5069, 6013, 6039, 6044, 6045, 6060; and Warrensburg, 5643, 5916; reported from the more temperate regions of Europe, North America, and Asia.

52. *LECIDEA AURICULATA* T. Fries, Act. Reg. Soc. Scient.

Upsal., ser. 3, 3: 213. 1860.

Thallus moderately thick or absent, grayish-white to grayish-green or dark gray, areolate or areolate-verrucose, KOH-, I medulla—or blue. Hypothallus when present black. Apothecia sometimes proliferating,  $0.3-1.3$  mm. wide, subimmersed or adnate or moderately constricted below, the disk depressed or plane to strongly convex, black, bare or rarely slightly pruinose, the margin at first thick, sometimes becoming thin or disappearing. Hypothecium pale brown or moderately olivaceous-brown, the hyphae  $3-5\mu$  in diameter, with wide to narrow lumina, irregularly or vertically arranged, conglutinate-fragile. Exciple usually quite distinct from the hypothecium, brown-black or reddish-brown externally, pale pinkish-brown to nearly hyaline within, KOH externally often more or less rose-purple, the hyphae  $4-6\mu$  in diameter at the apices and elsewhere  $2-6\mu$ , with narrow lumina which sometimes appear net-like, radially arranged, conglutinate-fragile. Hymenium intensely greenish- or olivaceous-black above, paler to hyaline below,  $50-60$  ( $80$ ) $\mu$  thick, the paraphyses coherent or sometimes quite readily separable in KOH, about  $2\mu$  in diameter or often darkened and enlarged above to  $3-4$  ( $5$ ) $\mu$ . Spores hyaline, non-septate, oblong to ellipsoid,  $7-11 \times 3-4\mu$ .

On rocks, Chapel Pond, 5453, 5454; Mt. Marcy, 2930, 2943, 3069, 3260, 4262, 4263, 4276, 4277; Newcomb, 6066; reported from New Hampshire, Nevada, California, Arctic America, Greenland, Europe, and Asia. The varieties *evoluta* T. Fries and *diducens* (Nyl.) T. Fries are apparently represented in the collections cited above.

*L. inops* T. Fries and *L. promiscens* Nyl. appear to be similar to *L. auriculata* in habit and structure. As the identity of these two species is yet uncertain to me, the specimens which react to I in the medulla of the thallus may have to be referred eventually to one or the other of these species.

53. *LECIDEA ERRATICA* Koerb., Parerg. Lich., 3. Lief., p. 223. 1861.

Thallus absent, or thin, membranous, minutely rimulose, or verrucose, the verrucules scattered, minute, brownish or grayish-green, I-, KOH-. Hypothallus absent or thin, black or rarely bluish-black. Apothecia  $0.2-$



0.5 mm. wide, adnate or sometimes somewhat constricted below, the disk at first slightly depressed to plane, becoming plane to moderately convex, black, bare, the margin in age thin and often disappearing. Hypothecium varying from dark reddish-brown to brown-black or rarely dark purple-brown, usually homogeneous and somewhat gelatinized with the dark color in the interstices, or with a more compact, somewhat carbonized lower layer, the hyphae  $4-5\mu$  in diameter with more or less narrow lumina, irregularly arranged or more or less vertically arranged in an upper layer  $10-25\mu$  thick. Exciple distinct from the hypothecium, externally greenish-black, within hyaline to pale greenish-black or pale brownish, the color in the radial interstices of the hyphae which are  $4-11\mu$  in diameter when measurable, often externally highly gelatinized and confluent but with a firm, more or less distinct inner part, with lumina  $1-2\mu$  wide, unbranched to 3-4 times branched. Hymenium usually greenish-black or sometimes olivaceous- or brown-black above, hyaline to brownish or pale greenish-black below,  $40-50\mu$  thick, the paraphyses coherent,  $1.5-2\mu$  in diameter or sometimes enlarged to  $2.5\mu$  above. Spores hyaline, non-septate, narrowly to broadly ellipsoid,  $6-9 \times 2.5-3.5\mu$ .

On rocks, Marcy Brook, 3510, 6283, 6291, 6303, 6348, 6350, 6352, 6358, 6362, 6381, 6382, 6392, 6400, 6410; Newcomb, 3909, 4678; Seventh Lake, 4436; Warrensburg, 3731, 3732, 5136, 5403, 5405, 5408, 5415, 5418, 5419, 5420, 5423, 5438, 5443; known from Newfoundland and Maine to South Carolina and westward to Minnesota, and in Europe.

**Var. *planetica* (Tuck.) comb. nov.**

*Lecidea planetica* Tuck., Syn. N. Am. Lich. II, p. 131. 1888.

Transitional with the species but the thallus better developed and darker, of small verrucules about each apothecium or several apothecia seated on a single verrucule, dark olivaceous-gray to olivaceous-blackish or dark olivaceous-green.

On rocks, Chapel Pond, 5579; Marcy Brook, 6242, 6301, 6349; Newcomb, 4634, 5429; Warrensburg, 5132, 5138, 5141, 5401, 5646, 5685, 5694, 5702, 5823, 5860, 5871; known elsewhere from Maine and Ontario south to South Carolina and westward to Ohio and Minnesota. *Lecidea miccytho* Tuck. is but a form of this with an ochraceous thallus, as determined by a study of the original material in the Tuckerman Herbarium. The original material of *L. planetica* was also studied.

**Var. *paraclitica* (Nyl.) comb. nov.**

*Lecidea paraclitica* Nyl., Flora 55: 355. 1872.

As in the species or in var. *planetica* but on wood; thallus absent or well-developed, verruculose.

On wood, Newcomb, 4815; known elsewhere from New Hampshire and Iowa, and reported from Europe.

54. *Lecidea suberratica* sp. nov.

Pl. III, Fig. 2.

Thallus tenuis, citrinus, in herbario maxima parte demum sordide albidus, KOH leviter lutescens, I non reagens. Apothecia 0.15–0.3 mm. lata, adnata, disco primum depresso, demum bene convexo, nigro, nudo, demum immarginata. Hypothecium intense rufo fuscum. Excipulum KOH extus plus minus sordide aeruginoso-nigricans, intus sordide rufo-fuscum, colore in interstitiis radiantibus. Hymenium superne sordide olivaceo-nigricans, KOH nonnumquam plus minus cyanescenti nigricans, 30–40 $\mu$  crassum, paraphysibus gracilibus. Sporae incoloratae, simplices, octonae, ellipsoideae, 5–7.5  $\times$  2.5–3.5 $\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Newcomb, New York, J. L. Lowe n. 6021.

Thallus thin, discontinuous, yellowish-green, for the most part fading to sordid whitish in the herbarium, granulose, the granules less than 0.02 mm. wide, KOH with a slightly yellowish stain, I-. Apothecia 0.15–0.3 mm. wide, adnate, disk at first depressed, becoming strongly convex, black, bare, the margin at first more or less elevated but finally disappearing. Hypothecium dark reddish-brown, KOH-, I-, the hyphae 4–5 $\mu$  in diameter, with wide lumina, vertically arranged in an upper layer 25–30 $\mu$  thick, conglutinate-carbonaceous with the walls of the hyphae carbonized in the upper part of the hypothecium. Exciple continuous with the hypothecium, reddish-brown with some tint of olivaceous-black, KOH more or less sordid greenish-black externally and within sordid reddish-brown and gradually becoming concolorous with the hypothecium, the color in the radial interstices of the hyphae which are 3.5–8 $\mu$  in diameter, with lumina of variable width, conglutinate in KOH. Hymenium sordid olivaceous-black above, below becoming concolorous with the hypothecium, KOH- or in part more or less bluish-black, I almost at once sordid reddish-brown, 30–40 $\mu$  thick, the paraphyses coherent, simple or 1–2 branched, 1.5–2 $\mu$  in diameter and more or less constricted at the septa. Spores hyaline, non-septate, 8 in an ascus, ellipsoid, 5–7.5  $\times$  2.5–3.5 $\mu$ . Algal cells yellowish-green, oval to subglobose when simple, 7–13 $\mu$  in diameter; auto-spores frequently formed.

On rock under a stump in an area burned over about 25 years ago, Newcomb, 6021 (type); not known elsewhere. The apothecia of *L. erratica* are similar both externally and internally, but its thallus, when present, is membranous or verrucose.

55. *LECIDEA LAPICIDA* Ach., Meth. Lich., p. 37. 1803 (excl. syn. et var.).

Thallus variable in thickness, dark gray, areolate or areolate-diffract, the areoles contiguous, rather plane above, about 1 mm. wide, KOH-, I medulla blue. Apothecia 0.5–1 mm. wide, at first immersed within the

verrucules, becoming semi-immersed to adnate, the disk at first plane, becoming moderately convex, black, bare, the margin thin, persistent. Hypothecium pale to moderately dark brown, the hyphae  $2.5-5\mu$  in diameter, with moderately thick walls, vertically arranged, conglutinate. Exciple continuous with the lower part of the hypothecium, dark brown externally, pale olivaceous-brown within, with much granular matter dissolving at once in KOH though otherwise unchanged, the hyphae  $3-4.5\mu$  in diameter, with moderately thin walls, compactly arranged, conglutinate, fragile, with numerous and conspicuous crosswalls giving a somewhat pseudoparenchymatous appearance to the tissue. Hymenium greenish-black above, about  $100\mu$  thick, the paraphyses coherent above, about  $2\mu$  in diameter, usually darkened and enlarged to  $5\mu$  above. Spores hyaline, non-septate, ellipsoid,  $11-13 (15) \times 5-6\mu$ .

On rocks, Mt. Marcy, 2886; reported from the more temperate regions of the world. The specimen cited above may be referred to the f. *declinans* Nyl.

#### 56. *Lecidea amniculensis* sp. nov.

Pl. III, Fig. 3.

Thallus minute verruculosus, verruculae compactae, bene convexae, valde adnatae, ochraceae,  $0.1$  mm. latae, nec KOH, nec I reagens. Apothecia  $0.2-0.3$  mm. lata, adnata aut basi bene constricta, disco persaepe demum bene convexo, nigro, opaco, margine indistincta aut immarginata. Hypothecium sat clarum fulvum plurimum ex multis granulatis materiis. Excipulum parum distinctum. Hymenium superne sordide olivaceo-nigricans, KOH pallide et diffuse caerulescens aut intense aeruginoso-nigricans,  $50-55\mu$  crassum, paraphysibus inconspicuis, gracilibus. Sporae incoloratae, simplices, octonae, ellipsoideae vel late ellipsoideae aut nonnumquam ovoideae,  $6-8 \times 3-3.5\mu$ .— Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Lake Placid, J. L. Lowe n. 6404.

Thallus verruculose, the verrucules compacted, strongly convex, firmly attached, reddish-orange, about  $0.1$  mm. wide, KOH-, I-. Apothecia  $0.2-0.3$  mm. wide, usually moderately constricted below but varying from adnate to strongly constricted below, the disk at first slightly to moderately convex, usually becoming strongly convex, black, dull, immarginate or nearly so. Hypothecium rather bright yellowish-brown due mostly to abundant granular matter, I-, KOH brighter, the hyphae  $2-4\mu$  in diameter with moderately thick walls, at once irregularly arranged. Exciple scarcely differentiated. Hymenium sordid olive-blackish above, with considerable granular matter, sordid hyaline or sordid pale yellowish-brown below, I intensely blue-black in mass, KOH pale bluish to intensely greenish-black in the upper part, cloudy hyaline below,  $50-55\mu$  thick, highly gelatinized, the paraphyses inconspicuous, immersed in hymenial



jelly, coherent, the lumen (?) about  $1.5-2\mu$  wide. Spores hyaline, non-septate, 8 in an ascus, ellipsoid to broadly ellipsoid or sometimes ovoid,  $6-8 \times 3-3.5\mu$ . Algal cells morbid, without chloroplasts so far as seen, oblong with rounded ends to oval or globose,  $4-10\mu$  in the greater diameter.

On shaded, iron-stained rocks, Marcy Brook below Indian Falls, elev. 3300 ft., 6404 (type); not known elsewhere. The apothecia of *L. sylvicola* closely resemble those of this species, and the color of the hypothecium described for var. *sublivida* Vain. is similar, but the thallus is described as poorly developed in the variety and in the species is usually continuous or areolate-diffract. *L. botryoides* Nyl., *L. poliodes* Nyl., and *L. laxula* Nyl., as described by Vainio, seem similar, but all differ in having paler apothecia, in the lack of a greenish-black color in the hymenium, as well as in other less marked characters. The thallus may be merely stained with iron, but no other species is known with similar internal characters in the apothecium.

57. *LECIDEA SYLVICOLA* Flot., Lich. Schles., p. 8, no. 171. 1829  
(according to Vainio).

Thallus thin to moderately thick, scurfy to minutely rimulose or minutely granular, ashy to dark gray or brown-gray, KOH . I . Hypothallus absent or indicated by a slight blackening of the substratum. Apothecia solitary or sometimes conglomerate, 0.2-0.6 mm. wide, adnate to nearly sessile, often white-fimbriate at the base, the disk from the first or very soon convex to hemispherical, black or with a bluish-black tinge near the base, bare, immarginate. Hypothecium black or olivaceous-black, or brownish-black below and greenish-black above, in KOH greenish-black and often with a purplish tinge below, the hyphae  $3-5\mu$  in diameter, with lumina  $2-3.5\mu$  wide, sometimes vertically arranged in the upper half, conglutinate. Exciple doubtfully distinguished, pale bluish-black, the hyphae radially arranged, highly conglutinate. Hymenium moderately greenish-black, or above paler to hyaline or brownish,  $40-50$  ( $60$ ) $\mu$  thick, the paraphyses simple to several times branched, almost net-like,  $1-2\mu$  in diameter. Spores hyaline, non-septate, cylindrical to ellipsoid,  $6.5-8 \times 3-3.5$ (4) $\mu$ .

On rocks in moist shady places along Marcy Brook, 3376, 3383, 3403, 3405a, 6300, 6304-6307 incl., 6310, 6316, 6317, 6329-6337 incl., 6340, 6341, 6356, 6359, 6391, 6394, 6398, 6411, 6413; not known elsewhere in North America, the collections so reported being referable to other species; widely distributed in Europe.

2b. Hypothecium usually hyaline or pale throughout or at least in the lower half (see also 50. *L. atrocinnerea*)

3a. Exciple dark, at least opposite the hymenium

58. *LECIDEA ATOMARIA* T. Fries, Bot. Not., p. 110. 1865.

Thallus dark olivaceous-green to greenish-brown, verrucose, the verrucules scattered, up to about 0.7 mm. wide, I-, KOH-. Apothecia 0.2-0.45 (0.6) mm. wide, adnate, the disk at first depressed, remaining depressed or becoming plane, black, bare, the margin elevated. Hypothecium pale greenish-black or pale olivaceous to hyaline, granular-appearing, the hyphae  $4-5\mu$  in diameter, with narrow lumina, vertically arranged for the most part, fragmenting under pressure, not at all conglutinate. Exciple distinct from the hypothecium, dark brown or above somewhat greenish-black, the hyphae  $2-4\mu$  in diameter and enlarged to  $4-5\mu$  at the apices, with narrow lumina, more or less conglutinate. Hymenium intensely greenish-black or olivaceous-black above, paler below, in KOH the granular matter in the upper part dissolving but otherwise unchanged,  $40-50\mu$  thick, the paraphyses coherent, very indistinct,  $1.5-2.5\mu$  in diameter. Spores hyaline, non-septate, ellipsoid,  $5-6 (7) \times 2.5(3)\mu$ .

On rock, Chapel Pond, 5576, 5580; Warrensburg, 5706, 5707; reported elsewhere from Europe. The external appearance of the species is very much like that of *L. erratica*. The specimens cited above agree with Fries' description except that the exciple shows no violaceous color.

59. *LECIDEA CONFERENDA* Nyl., in Fellm., Lich. Arct. n. 177.  
1864 (according to Vainio), and Flora 49: 418. 1866.

Thallus very thin to moderately thick, granulose or subverrucose to areolate, the areoles 0.2-0.3 mm. wide, grayish or olivaceous, I-, KOH-. Hypothallus thin, discontinuous, black, or absent. Apothecia solitary or aggregated, 0.2-0.5 (0.8) mm. wide, adnate to moderately constricted below, the disk at first depressed or plane, often becoming convex or hemispherical, black, bare, the margin persistent or thinning and often disappearing. Hypothecium hyaline or nearly so, or olive-blackish, or purple-brownish, or dark brown above, the hyphae  $2-5\mu$  in diameter, with moderately wide lumina, sometimes vertically arranged above, conglutinate. Exciple distinct from the hypothecium, intensely greenish-black or within brown, the hyphae  $5-7\mu$  in diameter, radially arranged, conglutinate, the lumina variable in width. Hymenium more or less greenish-black above, subhyaline to pale violaceous-brown or pale greenish-black below,  $40-70\mu$  thick, the paraphyses coherent, sometimes slightly enlarged above, the exterior of the walls confluent, lumina about  $1.5\mu$  wide. Spores hyaline, non-septate, oblong with rounded ends or varying to oblong-ellipsoid,  $8-12 \times 2.5-4\mu$ .

On rock in a brook bed, Warrensburg, 5900; known elsewhere from Newfoundland (Waghorne, 1895, n. 358 in the Herbarium of the Acad. Nat. Sci. Philadelphia); reported from Newfoundland or Labrador by Eckfeldt (Bull. Torrey Bot. Club 22:256. 1895) but the specimen could not be

found in his collection; reported by Zahlbruckner from northern Europe, Asia, and America. The color of the exciple and the oblong spores sufficiently mark this species. The Adirondack specimen cited above may be referred to the var. *violascens* Vain.

60. **Lecidea rugosa** sp. nov.

Pl. III, Fig. 4.

Thallus squamulosus, squamis primum dispersis, minutis, convexis, demum compactis, crassioribus, sat laxe adnatis, ad 1.5 mm. latis et superne plicato-rugosis, cinereo-fuscis, nitidis, inferne atris, diffractam crustam efficientibus, nec KOH, nec I reagens. Hypothallus nullus. Apothecia 0.5-1 mm. lata, adnata, disco depresso, nigro, nudo, margine elevato, demum bene flexuoso. Hypothecium incoloratum. Excipulum superne aeruginoso-nigrum, in inferiore parte fusco-nigrescens et infimo pallide purpureo-fuscum. Hymenium superne intense aeruginoso-nigricans, 65-80 $\mu$  crassum, paraphysibus gracilibus aut sat gracilibus. Sporae incoloratae, simplices, octonae, ellipsoideae vel late ellipsoideae aut subglobosae, 9-11 $\times$ 6-8 $\mu$ , aut diametro 6-8 $\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope St. Huberts, New York, J. L. Lowe n. 5471.

Thallus squamulose, the squamules at first minute, dispersed, convex, enlarging and forming a moderately thick, somewhat loosely attached, diffract crust, with squamules up to 1.5 mm. wide and the surface cerebri-form, grayish-brown, shining, black on the underside, KOH-, I-. Hypothallus absent. Apothecia 0.5-1 mm. wide, adnate, the disk depressed, black, bare, with an elevated, black, shining, and finally strongly flexuose margin. Hypothecium hyaline, KOH-, I mottled blue in the upper portion, the hyphae about 2.5 $\mu$  in diameter, with moderately thick walls, soon irregularly arranged, immersed in a gelatinous matrix. Exciple distinct from the hypothecium and greenish-black above, intergrading with it and brownish-black below, pale purplish-brown in the lowest part, KOH-, I-, the hyphae about 2.5 $\mu$  in diameter with narrow lumina, the tips enlarged to 5-7 $\mu$  and the lumina also enlarged, immersed in a gelatinous matrix, radially arranged above. Hymenium intensely greenish-black above, paler below, KOH-, I blue then greenish-black, the asci sometimes reddish-brown in the lower half, 65-80 $\mu$  thick, the paraphyses gelatinous-coherent, rather easily separable in KOH, immersed in a gelatinous matrix, 1.5-2 $\mu$  in diameter. Spores hyaline, non-septate, 8 in an ascus, ellipsoid or broadly ellipsoid or subglobose, 9-11 $\times$ 6-8 $\mu$ , or 6-8 $\mu$  in diameter. Algal cells green or yellowish-green, usually oval to subglobose, 8-20 $\mu$  in diameter; frequently forming autospores.

On rock, Chapel Pond, n. 5471 (type); not known elsewhere. *L. cinereo-rufa* Schaer. closely resembles this species in external appearance but



differs in the color and the character of the hyphae in the hypothecium and the exciple. *L. rugifera* Vain., judging from Vainio's description, differs in having squamules which are whitish below and often on the sides as well, in the hymenium being only 40–44 $\mu$  thick, and in other less marked characters. *L. deusta* (Stenh.) Nyl., although of quite similar internal structure in the apothecia, has an areolate or finally subsquamulose thallus, and, according to Vainio, spores 10–15 $\times$ 5–6 $\mu$ .

61. *LECIDEA RUFONIGRA* (Tuck.) Nyl., Mém. Soc.  
Sci. Nat. Cherbourg 5: 120. 1857.

*Biatora rufonigra* Tuck., Proc. Amer. Acad. Arts and Sci. 1: 250. 1848.

*Psora rufonigra* (Tuck.) Schneid., Guide Study of Lichens, p. 119. 1898.

Thallus squamulose, the squamules of moderate size, becoming free at the margins and frequently ascending, pale olivaceous-brown above and often greenish-black toward the margins, the edge entire or lobed, clothed with black rhizoids below, I–, KOH–. Apothecia reaching 1 mm. in width, adnate, the disk nearly plane, black, bare, the margin rather thin, black, persisting. Hypothecium mostly hyaline, bluish-black at the juncture with the exciple, the hyphae about 2–4 $\mu$  in diameter, with thin walls, vertically arranged in an upper layer about 40 $\mu$  thick. Exciple distinct from the hypothecium, irregularly greenish-black within and with purplish-brown coloring matter in the interstices of the hyphae next to the hypothecium, the hyphae about 3.5–6 $\mu$  in diameter, thin-walled, radially arranged, immersed in a gelatinous matrix, the septa conspicuous and the tissue distinctly pseudoparenchymatous. Hymenium pale greenish-black and with brown granular matter above, in KOH the epithecium giving off a yellow-brown stain, otherwise unchanged, about 80 $\mu$  thick, the paraphyses coherent, in KOH moderately separable, 2.5 $\mu$  in diameter, usually enlarged to 5 $\mu$  above. Spores hyaline, non-septate, broadly ellipsoid, 9–11 $\times$ 4–5 $\mu$ , or, according to Fink, 8–15 $\times$ 5–7 $\mu$ .

On rocks, Warrensburg, 5662; reported by Zahlbruckner from North America.

62. *LECIDEA LYNCEOLA* T. Fries, Lich. Scand. II, p. 561. 1874.

Thallus poorly developed and uncertain or, according to Fries, thin, rimulose or subleprose, brownish or sordid grayish, or varying towards yellowish or reddish, I–, KOH indistinctly dark yellow. Apothecia 0.2–0.3 mm. wide, adnate, the disk at first plane to slightly convex, becoming moderately or rarely strongly convex, black, bare, the margin very soon disappearing. Hypothecium very pale grayish-blue in the central portion, nearly hyaline elsewhere, indistinctly pseudoparenchymatous, the hyphae irregularly and compactly arranged, conglutinate, 3–4.5 $\mu$  in diameter or sometimes as large as 5–7 $\mu$ , with thin walls. Exciple usually poorly developed and sometimes not at all differentiated, pale olive or pale oliva-

ceous-green, the hyphae radially arranged and more or less interwoven, about  $2\mu$  in diameter. Hymenium pale olive-grayish above,  $40-50\mu$  thick, the paraphyses conglutinate, indistinctly limited, coherent, the lumen distinct,  $1-2\mu$  wide. Spores hyaline, one or sometimes two-guttulate and thus apparently but not truly septate, ellipsoid,  $8-9.5 \times 3-4\mu$ , or, according to Fries, oblong or elongate-ovoid,  $6-9 \times 3\mu$ .

On rock along the edge of Chapel Pond, 5559; also reported from the Scandinavian countries. The determination was made from Fries' description, as named specimens were not available for comparison. In the specimen described by Fries the thallus was apparently better developed, the exciple and hymenium had a greater intensity of color, and the spores were more variable in shape. These differences, however, seem to lie well within the limits of specific variation.

3b. Exciple hyaline or at least pale within, or lacking

4a. Hyphae of the hypothecium usually conglutinate, rarely gelatinized or imbedded in a gelatinous matrix (see also 77. *L. adirondackii*, 81. *L. cellularis*, and 86. *L. hypopta*)

5a. Exciple grading into the hypothecium with little or no change, usually not markedly conglutinate or gelatinized

6a. Spores broadly ellipsoid, large

63. *LECIDEA TORNOËNSIS* Nyl., Herb. Mus. Fenn., p. 110. 1859  
(according to Vainio).

Thallus absent or thin, membranous to subgranulose, olivaceous-brown or olivaceous-green, KOH-, I-. Apothecia  $0.2-0.6$  mm. wide, adnate to quite strongly constricted below, the disk more or less convex, reddish-brown to brownish-black or sometimes black, bare, the margin rarely visible. Hypothecium hyaline to pale yellowish-brown, the hyphae  $4-5\mu$  in diameter, with walls of variable thickness, irregularly arranged, highly gelatinized. Exciple continuous with the hypothecium, pale brown or moderately brown with darker radial streaks within, darker externally, often indistinctly limited or poorly developed, the hyphae  $4-8\mu$  in diameter, with lumina  $1-2\mu$  wide, highly gelatinized, often brown at the tips. Hymenium with a gelatinous cover up to  $10\mu$  thick, some shade of brown above, pale below, intergrading with the hypothecium, about  $130-180\mu$  thick, the asci at irregular levels, paraphyses coherent, simple to somewhat net-like,  $1-3\mu$  in diameter, usually dark brown and enlarged to  $6\mu$  above. Spores hyaline, non-septate, broadly ellipsoid,  $16-21 \times 11-14\mu$ , the wall  $1.5-3\mu$  thick, sometimes in two layers.

On bark or rarely growing onto decorticate wood, Chapel Pond, 3730, 5602; Avalanche Lake, 6153; Mt. Marcy, 6420; known elsewhere from Washington; reported from New Hampshire and California; reported from the Northern Hemisphere by Zahlbruckner. The large, thick-walled spores distinguish the species.

6b. Spores oblong to ellipsoid, small or moderate-sized

64. *LECIDEA LITHOPHILA* (Nyl.) T. Fries, Lich. Scand. II, p. 495. 1874.  
*L. lapicida* \*\**L. lithophila* Nyl., Lich. Scand., p. 226. 1861 (p.p.).

Thallus variable in thickness, smooth or cracked to areolate, gray, I-, KOH-. Apothecia 0.5-1.5 mm. wide, at first immersed, remaining so or emerging and becoming more or less adnate, the disk plane to slightly convex, black, bare or with a slight rusty-red pruina, the margin thin, persistent, black, bare. Hypothecium hyaline, the hyphae radially and compactly arranged throughout or only in the upper part, sometimes loosely arranged below with many air spaces. Exciple dark olivaceous-black externally or slightly greenish-black along the side of the hymenium, with some granular matter, in KOH granular matter disappearing at once and more distinctly greenish-black above, otherwise unchanged, the hyphae 4-5  $\mu$  in diameter, with thin or thick walls, radially and compactly arranged, more or less conglutinate. Hymenium olivaceous-black or olivaceous-brown above, in KOH decidedly olivaceous-brown, 50-60  $\mu$  thick, the paraphyses coherent, 1.5-2  $\mu$  in diameter, usually enlarged to 2.5-4  $\mu$  above. Spores hyaline, non-septate, oblong or oblong-ellipsoid, sometimes slightly curved, 9-11  $\times$  3.5-4  $\mu$ .

On rocks, Indian Falls near Mt. Marcy, 2660; reported by Zahlbruckner from the more temperate regions of the world.

This species is very similar to *L. enteromorpha* (Flot.) Vain., but differs in the color of the epithecium in KOH. The collection cited above is hardly typical, as the thallus is thin and the epithecium is not as markedly colored as in the European specimens examined.

65. *LECIDEA ENTEROMORPHA* (Flot.) Vain., Act. Soc. pro Fauna  
 Flora Fenn. 57<sup>2</sup>: 138. 1934.

*Lecidea atroalba* var. *enteromorpha* Flot., Lich. Exs. Schles., p. 8, n. 178. 1829 (according to Vainio).

*Lecidella plana* (Lahm) Nyl., Flora 55: 552. 1872.

*Lecidea plana* Lahm apud Koerb., Par. Lich., 3. Lief., p. 211. 1861.

Thallus variable in thickness, gray, membranous and smooth to fissured, or verrucose or verrucose-areolate to areolate, I-, KOH-. Hypothallus black, inconspicuous. Apothecia 0.5-1.3 mm. wide, adnate to slightly constricted below or seated between the verrucules or areoles, plane to moderately convex, black, bare, the margin becoming thinner but usually persisting. Hypothecium hyaline or nearly so, unchanged in KOH except granular matter usually entirely dissolving, the hyphae 2.5-5  $\mu$  in diameter, with narrow lumina, vertically arranged in an upper layer 25-130  $\mu$  thick, conglutinate. Exciple greenish- or olivaceous-black externally, paler to hyaline within, sometimes with granular inclusions, the hyphae 4-8  $\mu$  in diameter, with moderately wide lumina, radially arranged, conglutinate. Hymenium olivaceous- or greenish-black above, paler or usually hyaline below, 55-65  $\mu$  thick, the paraphyses coherent, 2-2.5  $\mu$  in diameter or the



tips darkened and enlarged to  $3.5\text{--}5\mu$ . Spores hyaline, non-septate, oblong to oblong-ellipsoid,  $8\text{--}13 \times 3.5\text{--}5(5.5)\mu$ .

On rocks, Chapel Pond, 3822, 5547, 5551; Marcy Brook, 2650, 3404, 6365; Mt. Colden, 6257, 6262, 6264; Mt. Marcy, 2723, 2726, 2729, 2813, 3250; Newcomb, 6019; Warrensburg, 3543, 5687, 5807, 5819, 5825; reported from Nevada, and from Europe and Asia. Forma *perfecta* (Arn.) Vain., f. *perfectior* (Nyl.) Vain. and f. *subtumida* Vain. are apparently represented in the collections cited above.

*L. lithophila* is a very similar species, differing most noticeably in the olivaceous-brown (in KOH) color of the upper part of the hymenium. It has probably been confused with *L. enteromorpha* and a restudy of American collections is needed to determine the actual American distribution.

66. LECIDEA CLADONIOIDES (E. Fries) T. Fries, Lich. Scand. II, p. 417.  
1874.

*Biatora ostreata* var. *cladonioides* E. Fr., Summa Veg. Scand. I, p. 111. 1846 (nomen nudum, sec. Zahl., Cat. Lich. Univ. III, p. 865. 1925).

*Lecidea anthracophila* Nyl., Flora 48: 603. 1865.

Thallus squamulose, the squamules olivaceous-green to reddish-brown, appressed or the margin elevated, entire or more or less crenulate, bare or sorediate, below often white-sorediate, KOH-, I-. Apothecia solitary or often conglomerate, 0.3–0.7 mm. wide when solitary, moderately to strongly constricted below, the disk at once convex, pale reddish-brown to dark red-brown, bare, the margin thin, soon disappearing. Hypothecium hyaline, the hyphae  $2.5\text{--}5\mu$  in diameter, with thin walls, more or less vertically arranged above, immersed in a gelatinous matrix. Exciple more or less reddish-brown externally, paler to hyaline within, with some granular matter which dissolves at once in KOH and the outer part darkening to olivaceous-brown, the hyphae about  $4\text{--}6\mu$  in diameter, with lumina of variable width, radially arranged, conglutinate. Hymenium dark reddish-brown above, with considerable granular matter, KOH darkening to olivaceous-brown above, the granular matter dissolving, intergrading with the hypothecium, about  $30\text{--}40\mu$  thick, the paraphyses fragmenting on pressure, readily separating in KOH, about  $2\text{--}2.5\mu$  in diameter, darkened and enlarged above to  $5\mu$ . Spores hyaline, often apparently 1-septate, fusiform or oblong-fusiform,  $10\text{--}13 \times 2\text{--}3\mu$ .

On old or more often on carbonized wood, Newcomb, 4756, 5029, 5067, 6017, 6046, 6047; Warrensburg, 5768, 5914; reported from Vermont, Massachusetts, New Jersey and North Carolina and from Europe.

67. *LECIDEA PUNCTELLA* (Willey) Zahlbr., Cat. Lich. Univ. III, p. 815.  
1925.

*Biatora punctella* Willey, in Tuck., Syn. N. Amer. Lich. II, p. 23. 1888.

Thallus absent, but the substratum somewhat discolored. Apothecia 0.1–0.25 mm. wide, adnate, the disk soon moderately to strongly convex, black, or sometimes with an olivaceous tinge when wet, bare, immarginate. Hypothecium pale yellowish-brown, the hyphae about  $3\text{--}4\mu$  in diameter, with thick walls, vertically arranged above or sometimes nearly throughout, interwoven with more or less nodose and inflated hyphae  $3\text{--}5\mu$  in diameter and with thin walls. Exciple either absent or not differentiated from the hymenium or hypothecium, sometimes apparently represented by a dark line over the substratum. Hymenium sometimes with a hyaline gelatinous cover about  $8\mu$  thick, subhyaline or slightly olivaceous-brown throughout, KOH unchanged or with an evanescent violaceous stain,  $40\text{--}50\mu$  thick, the paraphyses rather easily separable in KOH,  $1.5\text{--}2.5\mu$  in diameter. Spores hyaline, non-septate, oblong to ellipsoid or ovoid-ellipsoid,  $5\text{--}7 \times 2.5\text{--}3\mu$ .

On decorticate wood in swamp, Warrensburg, 5121; known elsewhere from Massachusetts, from a study of the original specimen in the Tuckerman Herbarium. The plant is closely related to *L. turgidula* but differs in the smaller apothecia and smaller spores. It is close to and perhaps identical with *L. globularis* (Ach.) Nyl., as described by Vainio (Act. Soc. pro Fauna Flora Fenn. 57<sup>2</sup>: 225. 1934), but no specimens of the latter species have been available for comparison.

68. *LECIDEA TURGIDULA* E. Fries, Sched. Crit. I, p. 10. 1824.

Thallus absent or poorly developed, whitish to olivaceous, membranous to minutely granular or verruculose, KOH–, I–. Apothecia 0.2–0.5 mm. wide, adnate, the disk plane to moderately convex or rarely hemispherical, varying from pale olivaceous through brownish to black, bare or somewhat pruinose especially when young, immarginate, or the margin present and sometimes moderately thick in the light-colored apothecia. Hypothecium nearly hyaline to pale brownish, the hyphae  $2\text{--}3\mu$  in diameter, with thin walls, irregularly or vertically arranged throughout, conglutinate. Exciple intergrading with the hypothecium, sometimes only with the basal portion, pale olivaceous or brownish or blackish, the hyphae  $1\text{--}4\mu$  in diameter, usually with distinct lumina, conglutinate, sometimes dark at the tips. Hymenium hyaline or brownish or blackish above,  $50\text{--}60$  ( $80$ ) $\mu$  thick, the paraphyses coherent,  $1\text{--}2\mu$  in diameter or above enlarged to  $5\mu$  and frequently dark. Spores hyaline, non-septate or becoming indistinctly 1-septate, oblong to oblong-ellipsoid or rarely ellipsoid,  $7\text{--}13 \times 3\text{--}5\mu$ .

On decorticate wood or less often on bark, Chapel Pond, 3709, 3711,

3712, 3713; Boreas River C.C.C. Camp, 5160; Warrensburg, 5877, 5884; also from Maine, New Hampshire, Massachusetts, Minnesota, California, and Washington, and reported from Europe and Asia.

This species, supposedly common in North America, has been collected only a few times. The majority of the American specimens in the herbaria thus determined should be referred elsewhere.

5b. Exciple decidedly different in texture from the hypothecium, markedly conglutinate or gelatinized

69. *LECIDEA STIGMATEA* Ach., Lich. Univ., p. 161. 1810 (p. maj. p.).

Thallus variable, well-developed to absent, when present verruculose, the verrucules whitish to grayish or brownish, 0.1–0.3 mm. wide, I–, KOH– or yellow. Apothecia 0.4–1 mm. wide, adnate to somewhat constricted below, the disk at first slightly depressed to plane, becoming plane to moderately convex, black, bare, the margin at first moderately thick, thinning but usually persisting, black. Hypothecium usually hyaline, sometimes pale brownish, rarely with granular matter below, often appearing vesiculose, the hyphae 1–2  $\mu$  in diameter, apparently with thick walls, irregularly arranged or vertically arranged above in a layer up to 50  $\mu$  thick, conglutinate but breaking into large pieces under pressure. Exciple usually intergrading with the hypothecium both in color and structure, rarely sharply distinct, dark bluish-black externally, paler within and becoming hyaline, the hyphae 2–3  $\mu$  in diameter with elongated lumina, radially arranged, imbedded in a gelatinous matrix. Hymenium purplish-black or bluish-black or brown-black above, hyaline or slightly violaceous or brownish below, in KOH somewhat distinctly olivaceous above, 70–110  $\mu$  thick, the paraphyses coherent to moderately separable, in KOH easily separable, 1.5–2.5  $\mu$  in diameter, sometimes enlarged to 5  $\mu$  above and often dark. Spores hyaline, non-septate, ellipsoid to broadly ellipsoid, 10–16  $\times$  6–11  $\mu$ .

On rocks, represented by a single collection referable to f. *glabra* (Krempelh.) Vain., at Newcomb, 4399. The distribution of this species in North America is uncertain; it is reported as widespread in Europe.

70. *LECIDEA GONIOPHILA* Floerke, Gesellsch. Naturforsch. Freunde Berlin Mag. 3: 311. 1809.

Thallus absent or very thin, grayish-green or whitish, verruculose, the verrucules minute, about 0.1 mm. wide. Apothecia 0.3–0.8 mm. wide, adnate to moderately constricted below, the disk slightly depressed to plane, becoming plane to slightly convex, black, bare, the margin at first thick, thinning, sometimes disappearing, black. Hypothecium hyaline or rarely pale yellowish-brown, often with inclusions in the form of rock particles, the hyphae irregularly arranged, compactly so in an upper layer



about  $40\mu$  thick, loosely arranged with large air spaces below, slightly to moderately gelatinized. Exciple arising from the hypothecium, sometimes distinctly from the lower part, bluish- or greenish-black externally and within varying from hyaline to blackish, or reddish- or yellowish-brown in the innermost part and grading into the hypothecium, paler externally in the lower part, the hyphae  $4-8\mu$  in diameter, with lumina up to  $3\mu$  wide, conglutinate. Hymenium olivaceous-brown or greenish- or bluish-black above, pale pinkish or brownish below,  $60-80\mu$  thick, the paraphyses moderately separable in KOH,  $1.5-2\mu$  in diameter, sometimes enlarged to  $2.5\mu$  above and often darkened. Spores hyaline, non-septate, ellipsoid to broadly ellipsoid,  $11-14 \times 7-10\mu$ .

On rock. Chapel Pond near St. Huberts, 5469 and 5477. The distribution of this species in North America is uncertain; it is reported as widespread in Europe.

71. *LECIDEA GRANULATA* H. Magn., Med. f. Göteb. Bot.  
Trädg. 10: 40. 1936.

Thallus moderately well developed, grayish-white, verrucose, the verrucules  $0.15-1$  mm. wide, or more or less fused and the thallus verrucose-areolate, I-, KOH- or very pale yellow. Apothecia solitary or conglomerate,  $0.4-1$  mm. wide, adnate to moderately constricted below, sometimes proliferating, the disk at first slightly depressed to slightly convex, becoming plane to moderately convex, olivaceous-black and brown-black to black, rarely at first paler and olivaceous-yellow, bare, the margin becoming thin but usually persisting. Hypothecium hyaline or pale olivaceous or brownish, with granular matter in the lower portion, the hyphae  $2-2.5\mu$  in diameter, with lumina about  $1\mu$  wide, vertically or irregularly arranged, conglutinate. Exciple intergrading with the hypothecium, more or less bluish-black to pale olivaceous-brown above, paler below, with granular matter dissolving wholly or in part in KOH but otherwise unchanged, the hyphae  $3-10\mu$  in diameter, with lumina  $3-6\mu$  wide, radially arranged, immersed in a gelatinous matrix. Hymenium olivaceous-brown or greenish-black above, hyaline or pale below, often with a gelatinous cover up to  $10\mu$  thick,  $60-100\mu$  thick, the paraphyses coherent to easily separable, in KOH easily separable, simple or branched and somewhat net-like,  $1-1.5\mu$  in diameter, sometimes enlarged to  $2.5\mu$  above, often darkened. Spores hyaline, non-septate, ellipsoid to broadly ellipsoid,  $10-13$  ( $16$ )  $\times$   $5-7\mu$ .

On rock, Mt. Marcy, elev. 4900-5300 ft., 3072, 3150 (type), 3152, 3211, 4199; Mt. Colden, elev. 3800 ft., 6233, 6246; not known elsewhere. The close relationship of this species to *L. stigmatæa* and associated species seems clear. The species is very close to *L. elaeochroma* f. *pilularis* (Dav.?) T. Fries, agreeing with such specimens as were available for comparison.

It also resembles *L. subcongrua* Vain. externally, but differs in the size and character of the hyphae in the exciple and hypothecium.

72. *LECIDEA PLACIDENSIS* H. Magn., Med. f. Göteb. Bot. Trädg.

10: 41. 1936.

Thallus moderately thick, verrucose-areolate, grayish or yellowish-green, I, KOH with a distinct yellow stain. Apothecia 0.4–0.7 mm. wide, adnate, the disk at first plane or slightly depressed, becoming somewhat convex, black, thinly white-pruinose to bare, the margin at first moderately thick to thin, becoming thin and sometimes disappearing, black, rather even. Hypothecium hyaline, the hyphae 2.5–3.5 $\mu$  in diameter, with moderately thick walls, continuous with the hymenium and vertically arranged in an upper layer about 65 $\mu$  thick, irregularly arranged below, somewhat conglutinate. Exciple continuous with the lower part of the hypothecium, more or less pale olivaceous-green with much granular matter which dissolves at once in KOH, otherwise no change, the hyphae about 5 $\mu$  in diameter, with invisible or extremely narrow lumina, parallel-arranged, gelatinized and also imbedded in a gelatinous matrix. Hymenium moderately olivaceous-green above, with some granular matter which dissolves in KOH, otherwise unchanged, 50 $\mu$  thick, the paraphyses moderately separable, in KOH quite readily separable, 2–2.5 $\mu$  in diameter, more or less constricted at the frequent septa, often darkened and enlarged to 5 $\mu$  above. Spores hyaline, non-septate, ellipsoid to broadly ellipsoid, 9–11  $\times$  5–6 $\mu$ .

On rocks, Mt. Marcy, 3067 (type); not known elsewhere. The internal structure of the apothecium is similar to that of *L. luteoatra* Nyl., but this species has larger spores, a better development of the hypothallus, and differs in other minor characters.

73. *LECIDEA RUSSELLII* Tuck., Proc. Amer. Acad. Arts and Sci.

5: 417. 1862.

*Psora Russellii* (Tuck.) Schneid., Textb. Gen. Lich., p. 141, pl. 25. 1897.

Thallus squamulose, the squamules middle-sized to large, olivaceous-green or reddish-brown above, with entire or nearly entire, appressed or ascending, and white margins, white below, in KOH forming a very slight yellow stain, I. Apothecia arising on the squamules, 0.5–1.5 mm. wide, adnate, the disk soon convex, bright reddish-brown, bare, or according to Tuckerman, often with a greenish bloom, the margin inconspicuous, soon disappearing. Hypothecium very pale yellow to nearly hyaline, with many air spaces below, the hyphae 4–5 $\mu$  in diameter, with moderately thick walls, irregularly arranged, conglutinate and also immersed in a gelatinous matrix. Exciple subhyaline with reddish crystals scattered throughout, in KOH bright pinkish-red, otherwise unchanged, the hyphae 3–4 $\mu$  in diame-

ter, with moderately wide lumina, conglutinate and also immersed in a gelatinous matrix. Hymenium intensely reddish-brown above, on account of much crystalline matter which becomes bright pinkish-red in KOH, otherwise unchanged.  $65-70\mu$  thick, the paraphyses coherent,  $2\mu$  in diameter, sometimes enlarged to  $5\mu$  above. Spores hyaline, non-septate, ellipsoid,  $11-13 \times 5\mu$ .

On rocks, Warrensburg, 5236, 5252, 5735, 5739, 5741, 5742, 5748; reported as widely distributed in North America on calcareous rocks.

74. *LECIDEA ARNOLDII* Lynge, Lich. Nov. Zemlya, p. 108, tab. X, fig. 2, tab. XII, fig. 3. 1928.

Thallus thick, areolate, the areoles bay or chestnut, 0.4-1.5 mm. wide, plane to somewhat convex, the margin black, inrolled, I-, KOH medulla, cortex at first giving a yellowish or yellowish-orange stain, and finally forming fascicles of ruby-red, acicular crystals. Hypothallus black, sometimes absent. Apothecia solitary or often contiguous or confluent, 0.5-1.5 mm. wide, at first immersed, then emerging and becoming adnate, the disk pinkish- to dark reddish-brown, bare, slightly to moderately convex, at first immarginate, later the margin present and thin, according to Lynge present at first and disappearing in age. Hypothecium hyaline or nearly so, KOH unchanged or pale yellowish, the hyphae  $2-3\mu$  in diameter, with thick walls, more or less vertically arranged and densely compacted, intermixed with thin-walled vesicular hyphae which are up to  $9\mu$  in diameter. Exciple sometimes intergrading with the hypothecium, externally somewhat yellowish-brown, within more or less olivaceous or yellowish due mostly to granular matter, in KOH light olivaceous-brown externally, within the granules dissolving and producing at first a bright yellow and then an orange-red color, finally forming acicular crystals as in the thallus, the hyphae  $2.5-5\mu$  in diameter, often decidedly nodulose, with lumina of variable width, radially arranged, immersed in a gelatinous matrix or externally gelatinized, usually several times branched to somewhat net-like. Hymenium sometimes with a hyaline gelatinous cover, reddish- or yellowish-brown above, in KOH olivaceous-brown,  $50-80\mu$  thick, the paraphyses coherent, readily separating in KOH,  $2-2.5\mu$  in diameter or enlarged to  $5\mu$  above and often darkened. Spores hyaline, non-septate, 8 in an ascus, ellipsoid to oval or oblong with rounded ends,  $10-13 \times 5-6\mu$ . Conidangium sunken in the thallus, the conidia hyaline, slender, more or less curved,  $30 \times 1\mu$ .

On rock, Mt. Marcy, elev. 4900-5300 ft., 2832, 3236; Mt. Colden, elev. 4500 ft., 6273; reported elsewhere from the original locality in Nova Zemlya. Dr. A. H. Magnusson suggested the identity of this species, and comparison with the original description shows only two points of noteworthy difference. In Lynge's original specimen the hypothallus was not



visible, and the apothecia were marginate at first and became immarginate. These differences seem to be within a range of variation for this species. *L. aenea* Duf. is a very similar species but differs in the negative or very slight reaction of the thallus to KOH, and in the character of the excipular hyphae, which are less definitely radially arranged and are not constricted at the septa.

- 4b. Hyphae of hypothecium usually markedly gelatinized or imbedded in a gelatinous matrix, at least below, and the exciple often likewise (see also 63. *L. tornøensis*, 66. *L. cladonioides*, and 73. *L. Russellii*)

- 5a. Spores subglobose to globose, at least in part

75. *LECIDEA NYLANDERI* (Anzi) T. Fries, Lich. Scand. II, p. 462.  
1874.

*Biatora Nylanderi* Anzi, Cat. Lich. Sondr., p. 75. 1860.

Thallus granulose, the granules scattered or sometimes compacted, minute, whitish or greenish-white or sometimes olivaceous, I-, KOH-. Apothecia solitary or occasionally conglomerate, 0.3–0.7 mm. wide, adnate to more or less constricted below, the disk at first plane or slightly depressed, becoming somewhat convex or rarely nearly hemispherical, dark reddish-brown to black or sometimes pale reddish-brown, rarely varicolored, bare, the margin usually thick and conspicuous at first, often elevated, paler than the disk or sometimes concolorous, in age usually becoming thin and sometimes disappearing, or sometimes ample and prominent below, narrowing above to the disk. Hypothecium hyaline or with a faint yellowish tinge, the hyphae in the upper part 2.5–3.5 $\mu$  in diameter, irregularly or rarely vertically arranged, slightly gelatinized, intermixed with cross hyphae which reach a diameter of 5 $\mu$ , in the lower part the hyphae 3–5 $\mu$  in diameter with lumina 1–1.5 $\mu$  wide, mostly irregularly arranged, very highly gelatinized. Exciple distinct from the hypothecium, more or less olivaceous or yellowish-brown with much granular matter, in KOH hyaline or nearly so throughout and the granular matter dissolving, the hyphae conglutinate, the walls confluent, with very slender lumina, but externally distinctly limited, with brown tips 2.5–5 $\mu$  in diameter, and with wide lumina. Hymenium dark olivaceous or yellowish-brown above, usually with granular matter which dissolves in KOH, otherwise scarcely changed, 50–60 $\mu$  thick, the paraphyses moderately coherent in KOH, 1.5–2 $\mu$  in diameter or often enlarged to 5 $\mu$  and frequently brown above. Spores hyaline, non-septate, globose or nearly so, 4.5–6(7) $\mu$  in diameter.

On the bark of coniferous trees, Warrensburg, 5440; known elsewhere from Massachusetts and California; and reported from Europe.

76. *LECIDEA FUSCESCENS* Sommerf., Vet. Ak. Handl., p. 114. 1823.

Thallus often poorly developed, verruculose, the verrucules scattered, whitish to grayish, closely attached, 0.1–0.25 mm. wide, I-, KOH- or

yellowish. Hypothallus thin, black, or absent. Apothecia 0.2-0.55 mm. wide, adnate to moderately constricted below, the disk at first plane, becoming more or less convex or rarely strongly convex, brown-black to black or rarely pale yellowish or olivaceous, bare, the margin at first rather thick, becoming thinner and frequently disappearing. Hypothecium often seated upon a tissue which contains algal cells, hyaline or nearly so, the hyphae in the upper part compactly and often vertically arranged, conglutinate, below irregularly arranged and highly gelatinized. Exciple arising from the hypothecium or rarely apparently distinct from it, sometimes with a few algal cells in the lower part, hyaline or more or less olivaceous or blackish externally, rarely with granular matter dissolving at once in KOH, the hyphae coarse, 5-11 $\mu$  in diameter, often nodulose, with lumina of variable width but usually slender, highly gelatinized. Hymenium brownish to blackish above, 55-65 $\mu$  thick, the paraphyses strongly coherent, 2 $\mu$  in diameter or frequently enlarged to 5 $\mu$  above, and often darkened. Spores hyaline, non-septate, globose or subglobose, or sometimes varying to broadly ellipsoid, 5-7 $\mu$  in diameter, or 7-9 $\times$ 5-6 $\mu$ .

On bark, Indian Falls, 2989; known elsewhere from Michigan and Washington; reported from California, and from Labrador; reported from the Northern Hemisphere by Zahlbruckner. The New York State and Michigan specimens differ from the others examined in the persistently pale color of the apothecia, and in the presence of granular matter in the exciple, but no anatomical differences were found. The frequent presence of algal cells inside the apothecia suggests a relationship to the genus *Lecanora*, and this species has been placed there by some authors, including Vainio. *Lecanora* and *Lecidea* do in fact intergrade, as explained in the introduction, and this species is included here partly as a matter of convenience to lichenologists, partly because its position and that of several others is not known at present. Such species can be referred with equal propriety to either genus.

5b. Spores oblong to ellipsoid

6a. Spores minute, 4-7 $\times$ 1.5-2 $\mu$ ; hymenium 25-30 $\mu$  high

77. *LECIDEA ADIRONDACKII* H. Magn., Med. f. Göteb. Bot. Trädg.

10: 22, 1936.

Thallus yellowish-green to dark green, granular, variable in thickness, I-, KOH-. Hypothallus white and fimbriate, or often absent. Apothecia solitary or occasionally conglomerate, 0.2-0.4 mm. wide, when conglomerate up to 0.5 mm., adnate or often constricted at the base, the disk convex from the first, smooth and even to convoluted and finally divided, black or sometimes livid-blackish or reddish-brown, bare, immarginate. Hypothecium usually moderately pale olivaceous- or greenish-black, but varying from very pale olivaceous to distinctly greenish-black, paler below, KOH usually more or less olivaceous- or greenish-black, varying from

distinctly greenish-black to pale olivaceous or pale yellowish to nearly hyaline, with abundant granular matter instantly dissolving in KOH, the hyphae  $2.5-6\mu$  in diameter, with thin walls and the lumina often giving a vesicular appearance to the vertical section of the tissue, irregularly arranged, somewhat conglomerate. Exciple usually absent, if present continuous with the hymenium and concolorous with it. Hymenium usually olivaceous- or greenish-black above, pale olivaceous or olivaceous-brown to dark greenish-black below, in KOH usually more or less olivaceous- or greenish-black or rarely olivaceous-brown above, paler below,  $25-30\mu$  thick, the paraphyses coherent,  $2-2.5\mu$  in diameter or sometimes darkened and very slightly enlarged above. Spores hyaline, non-septate, cylindrical to narrowly ellipsoid,  $4-5 \times 1.5-2\mu$ .

On the underside of rocks on talus slopes, usually associated with *Lecidea lucida*, Chapel Pond, July 12, 1932 (type), 3330, 3352, 3355, 3358, 3359, 3363, 3365, 3367, 3368, 3370, 3782, 3787, 3789, 3790, 3793, 5526, 5546; Marcy Brook, 6311, 6364; Newcomb, 3936, 4056, 4059, 4061, 4062, 4080, 4082, 4089, 4096, 4128, 4144, 4147, 4351, 4359, 4364, 4369, 4372, 4374, 4375, 4376, 4393, 4701, 4743, 4750; not known elsewhere.

This species is apparently very close to *L. tuberculata* Sommerf. As only one specimen of the latter species has been seen, Magnusson's comparisons are given here. "The new species seems to come near to *L. tuberculata* Smrft. and has a similar though generally thicker and  $\pm$  regular, citrine thallus. But the apothecia are smaller, quite regular and without a bluish shade, the hypothecium is as pale as the hymenium and the blue-green exciple of *L. tuberculata* is not developed."

78. *LECIDEA LUCIDA* Ach., Meth. Lich., p. 74. 1803.

Thallus thin to moderately thick, verruculose or granulose, the verrucules or granules  $0.025-0.2$  mm. wide, bright greenish-yellow or yellowish-green, KOH-, I-. Hypothallus thin and white-fimbriate, or absent. Apothecia solitary or rarely conglomerate,  $0.2-0.4(0.5)$  mm. wide, adnate, convex, pale or lemon-yellow to olivaceous- or brownish-yellow, bare, immarginate. Hypothecium hyaline, the hyphae  $2-4\mu$  in diameter, with lumina  $1-1.5\mu$  wide, loosely and irregularly arranged, with granular matter which instantly dissolves in KOH, otherwise unchanged. Exciple continuous with the hypothecium, externally intensely olivaceous-yellow, hyaline within, KOH hyaline throughout, the hyphae arranged as in the hypothecium or externally parallel. Hymenium intensely yellow-olivaceous above, hyaline or very pale yellow below, KOH nearly hyaline throughout,  $25-30\mu$  thick, the paraphyses coherent, in KOH readily separable,  $1.5-2\mu$  in diameter. Spores hyaline, non-septate, cylindrical or narrowly clavate, sometimes slightly curved,  $5-7(8) \times 1.5-2\mu$ .

Usually on rocks, rarely on bark and old wood, Chapel Pond, 3356, 3357, 3360, 3364, 3366, 3783, 3791, 3794, 3801, 3808, 3814, 3815, 3816, 3817, 3820, 5615; Newcomb, 2937, 4051, 4053, 4058, 4064, 4071, 4083, 4093, 4097, 4100, 4113, 4126, 4129, 4130, 4136, 4148, 4345, 4353, 4398,



4726, 4899, 4933, 4970, 6054; Warrensburg, 5112, 5915; also reported from Massachusetts and Minnesota; reported by Zahlbruckner from the temperate regions of the Northern Hemisphere.

6b. Spores medium-sized,  $7-24 \times 2.5-8\mu$ ; hymenium  $40-70\mu$  or more high

7a. Hymenium more or less greenish- or bluish-black above or throughout

79. *LECIDEA CAESIOATRA* Schaer., Naturw. Anz. 2<sup>2</sup>: 10, footnote 8. 1818.

*Lecidea arctica* Sommerf., Suppl. Flor. Lapp., p. 156. 1826.

Thallus verruculose, the verrucules 0.1–0.2 mm. wide, subglobose to elongated and subcorraloid, grayish-white to gray or olive-gray, KOH- or with a slight yellow stain, I-. Apothecia 0.4–1 mm. wide, adnate or rarely semi-immersed, the disk convex, black or rarely livid, bare, or more commonly with a bluish pruina, immarginate. Hypothecium pale yellowish-brown to moderately dark brown or reddish-brown, the hyphae  $2-4\mu$  in diameter, with thin walls, sometimes vertically arranged in the upper half, immersed in a gelatinous matrix, and sometimes with an admixture of irregularly arranged hyphae up to  $13\mu$  in diameter. Exciple continuous with the lower part of the hypothecium, pale yellow- or olivaceous-brown externally, within as in the hypothecium, the hyphae  $1.5-2\mu$  in diameter, with thin walls, immersed in a gelatinous matrix, closely compacted. Hymenium more or less greenish-black above, pale greenish- or olivaceous-black below,  $110-140\mu$  thick, the paraphyses coherent, gelatinized,  $1.5-2\mu$  in diameter. Spores hyaline, non-septate, subfusiform or oblong-ellipsoid,  $15-24 \times 5.5-8(9)\mu$ .

On moss or mossy earth, not yet found in the Adirondack region, but occurring in the mountains of New Hampshire. The spore size intergrades with that described for *L. pallida* T. Fries by Vainio but the other characters do not agree.

80. *Lecidea subramosa* sp. nov.

Pl. IV, Fig. 1.

Thallus modice crassus, pallido-cinereus aut intense cinereus aut caerulescenti-cinereus, compacto-verrucosus, verrucae subglobosae aut elongatae subcorallinaeque, 0.3–0.5 mm. latae, nec KOH, nec I reagens. Apothecia 0.5–1 mm. lata, adnata, disco mox convexo, nigro, nudo, immarginata. Hypothecium incoloratum. Excipulum incoloratum. Hymenium superne nigrum aut cyanescenti-nigricans,  $50-100\mu$  crassum, paraphysibus cohaerentibus, modice crassis. Sporae incoloratae, demum frequenter 1-septatae, octonae, ellipsoideae vel late ellipsoideae,  $7-10 \times 3-4(4.5)\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum in Mt. Marcy prope Lake Placid, New York, J. L. Lowe n. 3130.

Thallus moderately thick, pale gray to dark gray or bluish-gray, compacted-verrucose, the verrucules 0.3–0.5 mm. wide, subglobose or elon-

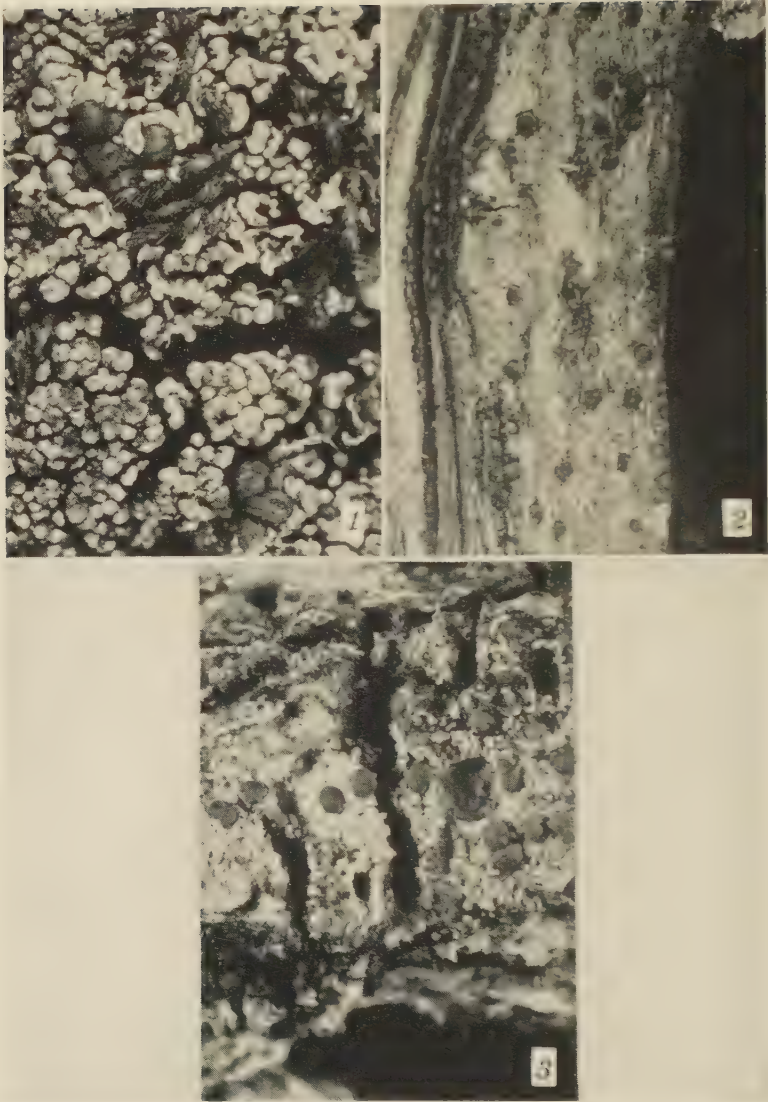


PLATE IV. Habit of type specimens of certain species of *Lecidea*, all  $\times 8$ . Fig. 1. *Lecidea subramosa*. Fig. 2. *Lecidea caesiocoronata*. Fig. 3. *Lecidea cellularis*.

gated and subcoralloid, KOH-, I-. Apothecia 0.5-1 mm. wide, adnate, the disk soon convex, black, bare, immarginate. Hypothecium hyaline, KOH-, I-, the hyphae 3-5 $\mu$  in diameter with walls of varying thickness, often constricted at the septa, vertically arranged in a layer up to 130 $\mu$  thick, immersed in a gelatinous matrix. Exciple hyaline or nearly so,

KOH-, I-, the hyphae  $2.5-3\mu$  in diameter, with wide lumina, radially arranged, immersed in a gelatinous matrix. Hymenium black or bluish-black above. KOH-, I- dark blue,  $50-100\mu$  thick, the paraphyses coherent,  $2-3.5\mu$  in diameter or sometimes enlarged to  $4\mu$  above. Spores hyaline, frequently becoming 1-septate, 8 in an ascus, ellipsoid or broadly ellipsoid,  $7-10 \times 3-4(4.5)\mu$ . Algal cells green or yellowish-green, oval to globose,  $5-16\mu$  in diameter; autospores not seen.

On soil, Mt. Marcy near Lake Placid (elev. 4900 ft.), 3110, 3112, 3130 (type); not known elsewhere. *L. caesioides* Schaer. is similar both in external appearance and in internal structure, but the verrucules of the thallus are smaller, the apothecia are often pruinose, and the spores are larger.

#### 81. *Lecidea cellularis* sp. nov.

Pl. IV, Fig. 3.

Thallus nullus aut verruculosus, verruculae discretae, depressae, albae,  $0.1-0.2$  mm. latae, nec KOH, nec I reagens. Apothecia solitaria aut saepe conglomerata,  $0.2-0.4$  mm. lata, adnata aut saepius basi modice constricta, disco primum pallide olivaceo, vergenti ad olivaceo-nigricanti, nudo, immarginata. Hypothecium fere incoloratum, KOH helveolum, pseudoparenchymaticum. Excipulum incoloratum, pseudoparenchymaticum. Hymenium totum pallide aeruginoso-nigricans,  $50-55\mu$  crassum, paraphysibus cohaerentibus, gracilibus aut superne modice incrassatis. Sporae incoloratae, simplices, octonae, oblongae, saepe leviter curvatae,  $8.5-11 \times 2.5\mu$ .—Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum prope Warrensburg, New York, J. L. Lowe n. 5947.

Thallus absent or poorly developed, verruculose, the verrucules scattered, flattened, white,  $0.1-0.2$  mm. wide, KOH-, I-. Apothecia solitary or often conglomerate in groups of two to five,  $0.2-0.4$  mm. wide, adnate or more often moderately constricted below, the disk at first pale olivaceous, darkening to olivaceous-blackish, bare, the margin indistinct. Hypothecium nearly hyaline, KOH pale yellow, I- or in part pale blue then reddish-brown, pseudoparenchymatous, the hyphae with conspicuous crosswalls, with lumina  $4-8\mu$  wide, ellipsoid to subglobose, conglutinate, vertically arranged almost throughout. Exciple continuous with the hypothecium, hyaline, KOH-, I-, conglutinate, pseudoparenchymatous, the hyphae radially arranged, with thin walls and lumina  $4-6\mu$  long,  $2-2.5\mu$  wide. Hymenium pale greenish-black throughout, KOH-, I- blue, soon reddish-brown,  $50-55\mu$  thick, the paraphyses coherent, about  $1.5\mu$  in diameter or above moderately enlarged to  $4\mu$ . Asci narrowly clavate. Spores hyaline, non-septate, 8 in an ascus, oblong and often slightly curved,  $8.5-11 \times 2.5\mu$ . Algal cells green or yellowish-green, oval to globose,  $5-15\mu$  in diameter; autospores not seen.



On bark of an elm in a swamp, near Warrensburg, New York, n. 5947; not known elsewhere. The pseudoparenchymatous structure is very unusual. *L. carneoalbens* Nyl. has a similar structure in the exciple, but differs markedly in the larger and paler apothecia and in the broader spores.

82. *LECIDEA LIMOSA* Ach., Lich. Univ., p. 182. 1810.

Thallus variable in thickness, white to olivaceous, cartilaginous-membranous or verruculose, the verrucules minute, about 0.1–0.15 mm. in diameter, I, KOH–. Hypothallus arachnoid, white. Apothecia 0.4–1 mm. wide, adnate, the disk moderately to strongly convex, brown-black to black, or in part translucent-olivaceous, bare, the margin at first thin, soon disappearing. Hypothecium pale olivaceous or brownish above, nearly hyaline below, the hyphae 2–4 $\mu$  in diameter, with wide lumina, conglutinate, irregularly arranged or vertically arranged in a layer up to 190 $\mu$  thick, in the lower part more highly gelatinized, the walls of the hyphae confluent and the lumina interwoven. Exciple continuous with the hypothecium and scarcely differentiated from it, pale bluish-black or olivaceous externally, the hyphae 1.5–2 $\mu$  in diameter, with thin walls, crowded, immersed in a gelatinous matrix. Hymenium bluish- or greenish-black above, bluish to hyaline below with scattered black granules. KOH scarcely changed except the granules become more or less blue, 60–80 $\mu$  thick, the paraphyses coherent, 4–6 $\mu$  in diameter, with lumina 1.5–2 $\mu$  wide. Spores hyaline, non-septate, subfusiform or oblong-ellipsoid to ellipsoid, 10–13(16)  $\times$  3–5 $\mu$ .

On soil or going over to rock in sheltered places, Mt. Colden, 6178; and Mt. Marcy, 3148; not known elsewhere in North America but reported by Zahlbruckner from the Northern Hemisphere. The collection reported by Fink (Lich. Flora U. S., p. 208) should be referred to *L. Berengeriana*.

83. *Lecidea caesiocoronata* sp. nov.

Pl. IV, Fig. 2.

Thallus plus minus innatus, aut eruptus, parum evolutus, verruculosus, verruculae cinereo-virescentes, 0.1–0.2 mm. latae, nec I, nec KOH reagens. Apothecia 0.3–0.5 mm. lata, adnata, disco primum leviter depresso aut leviter convexo, demum bene convexo, raro primum pallide olivaceo, plerumque intense olivaceo-nigricante aut intense olivaceo-fusco, nudo aut saepe marginem versus pruinoso. Hypothecium superne pallide olivaceum, inferne incoloratum. Excipulum extus olivaceo-fuscum, intus olivaceum aut incoloratum. Hymenium superne intense olivaceo-fuscum, KOH intense olivaceo-virescens aut aeruginoso-nigricans, 60–70 $\mu$  crassum, paraphysibus gracilibus. Sporae incoloratae, simplices aut nonnumquam 1-septatae, octonae, oblongae, pro parte leviter curvatae, 13–15.5  $\times$  4.5–5 $\mu$ . —Specimen typicum in Herbario Universitatis Michiganensis conservatum, lectum in Mt. Marcy prope Lake Placid, N. Y., J. L. Lowe n. 2911.

Thallus poorly developed, more or less innate, or erumpent, verruculose, the verrucules 0.1–0.2 mm. across, non-soresiate, occasionally confluent, greenish-gray, I–, KOH–. Apothecia 0.3–0.5 mm. wide, adnate, the disk at first slightly depressed to plane or slightly convex, becoming strongly convex or sometimes hemispherical, dark olivaceous-blackish or dark olivaceous-brown, or rarely at first pale olivaceous, bare or often pruinose at the juncture with the margin, immarginate or marginate, the thin, olivaceous or whitish margin disappearing. Hypothecium pale olivaceous above, hyaline below, KOH–, I–, the hyphae soon irregularly arranged, highly gelatinized and indistinctly limited, the lumen distinct, 1–1.5 $\mu$  wide, appearing net-like. Exciple continuous with the hypothecium, olivaceous-brown externally, olivaceous to hyaline within, the hyphae 1.5 $\mu$  in diameter, conglutinate, confluent. Hymenium dark olive-brown above, with considerable granular matter, pale below, KOH dark olivaceous-green or greenish-black in the upper half, with a colorless gelatinous cover, I blue, 60–70 $\mu$  thick, the paraphyses coherent, easily separated in KOH, about 2 $\mu$  in diameter. Asci clavate. Spores hyaline, non-septate or sometimes becoming 1-septate, 8 in an ascus, oblong and sometimes slightly curved, 13–15.5 $\times$ 4.5–5 $\mu$ . Algal cells yellowish-green, oval to globose, with thick walls in the older cells, 8–20 $\mu$  in diameter; autospores not seen.

On decorticate wood, Mt. Marcy at an elevation of 5300 ft., 2911 (type); not known elsewhere. This species is of uncertain relationships. *L. vernalis* and its allies have similar external characters, apothecial structure, and spore shape and size, yet the color of the hymenium suggests *L. pullata* (Norm.) T. Fries, which differs however in the frequent development of soredia, and in the vertical arrangement of two kinds of hyphae in the upper part of the hypothecium. *L. atrociridis* (Arn.) T. Fries differs in having larger apothecia, a thicker hymenium and narrower spores, and *L. olivascens* T. Fries, as described by Lynge, differs in the effuse and granular thallus, the pale yellow or yellowish-brown color of the hymenium, and in the inflated- or subventricose-clavate asci.

7b. Hymenium more or less brown above, or colorless

84. *LECIDEA CADUBRIAE* (Mass.) T. Fries, Lich. Scand. II, p. 468. 1874.  
*Biatora cadubriae* Mass., Sched. Crit., X, p. 176. 1856.

Thallus membranous or granulose or verruculose, whitish or grayish to dark gray, I–, KOH–. Hypothallus white and membranous, or absent. Apothecia 0.3–0.7 mm. wide, adnate to rarely constricted below, the disk at first slightly depressed to plane, becoming moderately convex, pale olivaceous-brown to dark reddish-brown, bare or sometimes thinly pruinose, the margin often at first paler, usually becoming concolorous, thinning and disappearing. Hypothecium usually seated upon an algal layer, hyaline or pale yellowish, the hyphae 4–7 $\mu$  in diameter, sometimes appearing in-

flated, with walls of variable thickness, irregularly arranged, densely compacted, immersed in a gelatinous matrix. Exciple sometimes with algal cells in the lower part, distinct from or sometimes confluent with the hypothecium, hyaline throughout or externally darker to yellowish-brown, the hyphae  $3-7\mu$  in diameter, with thin walls, immersed in a gelatinous matrix. Hymenium pale brown to dark brown above, hyaline below,  $50\mu$  thick, the paraphyses coherent, in KOH easily separable, slender throughout or enlarged to a diameter of  $4.5\mu$  above and sometimes darkened. Spores hyaline, non-septate, oblong-ellipsoid,  $8-13 \times 3.5-5\mu$ .

On cedar bark, Avalanche Lake, 6268; and Warrensburg, 5772; reported elsewhere from Europe. Hasse's record (Bryol. 12: 102. 1909) is based upon a plant belonging to another species.

*L. obscurella* (Sommerf.) Nyl., while similar, differs in the generally smaller apothecia, the narrower spores, the darker, distinctly enlarged apices of the paraphyses, the darker exciple which is continuous with the hypothecium, and by the absence of inflated hyphae in the hypothecium.

This species can be placed with equal propriety in the genus *Lecanora*. The remarks about the systematic position of *L. fuscescens* apply equally well to this species.

85. *LECIDEA CARNULENTA* (Tuck.) Fink, Contrib. U. S. Nat. Herb. 14<sup>1</sup>: 73. 1910.

*Biatora carnulenta* Tuck., Proc. Amer. Acad. Arts and Sci. 12: 179. 1877.

Thallus absent. Apothecia 0.2–0.5 mm. wide, adnate or rarely moderately constricted below, the disk at first plane, becoming moderately strongly convex, pale yellow or pinkish-brown or reddish-brown to brown-black and black, bare or white-pruinose, immarginate or the margin thin, often darker, usually soon disappearing. Hypothecium usually pale brownish above, hyaline below, the hyphae vertically arranged above in a layer up to  $50\mu$  thick, somewhat gelatinized, below  $2-3\mu$  in diameter, with thin walls, irregularly arranged, highly gelatinized and immersed in a clear gelatinous matrix. Exciple arising from the lower part of the hypothecium, brownish or darker externally and often with a gelatinous cover, hyaline or pale brownish within, the hyphae  $1.5-2.5\mu$  in diameter, with thin walls, radially arranged, immersed in a slightly cloudy gelatinous matrix. Hymenium more or less brown or nearly hyaline above, hyaline below, often with granular matter which dissolves at once in KOH, otherwise unchanged or slightly darker above,  $50-55\mu$  thick, the paraphyses usually separable with difficulty in KOH, probably gelatinized, sometimes brownish above, with lumina  $1.5-2\mu$  wide or above sometimes enlarged to  $4\mu$ . Spores hyaline, non-septate, oblong-ellipsoid to ellipsoid,  $7-11 \times 3-4.5\mu$ .

On old wood, Adirondacks, 1873, C. H. Peck (in the Farlow Herbarium); known from Grand Manan, N. B., New Hampshire, Massachusetts, Illinois and Iowa, chiefly from a study of the original specimens in the



Tuckerman Herbarium. This species seems to be close to *L. sphaerella* (Hedl.) Vain., agreeing with Vainio's description except for minor discrepancies. In the American species the thallus is never developed to the extent described for *L. sphaerella*, the apothecia frequently become much darker, the hypothecial and excipular hyphae are thin-walled rather than thick-walled, and granules are frequently present in the hymenium.

86. *LECIDEA HYPOPTA* Ach., Meth. Lich., p. 61. 1803.

Thallus absent or thin, white to greenish-gray or olivaceous, membranous, smooth to areolate, or subverruculose, the verrucules about 0.1 mm. wide, I-, KOH-. Apothecia 0.25-0.6 mm. wide, usually adnate, at first somewhat convex, becoming moderately to strongly convex, pale olivaceous to olivaceous-brown or black, bare, the margin usually thin, often disappearing. Hypothecium usually olivaceous- or reddish-brown in the upper half, hyaline below, the hyphae in the upper part 2.5-4 $\mu$  in diameter, with narrow lumina, conglutinate, usually vertically arranged, below irregularly arranged. Exciple usually arising from the lower part of the hypothecium, pale olivaceous-brown or yellowish-brown externally, paler to hyaline within, the hyphae 4-7 $\mu$  in diameter at the apices, within the walls more or less confluent, the lumina about 1-2 $\mu$  wide. Hymenium yellowish- or olivaceous-brown above, hyaline below, 40-60 (80) $\mu$  thick, the paraphyses coherent, about 4 $\mu$  in diameter, usually indistinct in outline below, frequently brownish and enlarged to 4 $\mu$  above, the lumina 1-2 $\mu$  wide. Spores hyaline, non-septate, ellipsoid, 8-11 $\times$ 4-5 $\mu$ .

On decorticate wood, Newcomb, 3967, 6003, 6006; Warrensburg, 5813, 5853; reported elsewhere from Europe.

87. *LECIDEA ERYTHROPHAEA* Floerk., in Sommerf., Suppl. Fl. Lappl., p. 163. 1826.

Thallus white to greenish or olivaceous, thin, fibrous, or thickened to form minute granules or verrucules, KOH-, I-. Apothecia 0.3-0.6 mm. wide, varying from adnate to strongly constricted below, the disk usually plane or sometimes slightly convex, usually more or less reddish-brown or brown-black, or sometimes in the young apothecia rather light yellowish-brown, bare, the margin at first usually moderately thick, darker than the disk, persistent or sometimes disappearing. Hypothecium hyaline or pale yellowish, the hyphae irregularly arranged or vertically arranged in an upper layer 50-60 $\mu$  thick, not gelatinized in the upper half, in the lower half highly gelatinized, confluent, the lumina 1.5-2 $\mu$  in diameter. Exciple arising from either the lower or the upper part of the hypothecium, more or less yellowish-brown externally, hyaline within, KOH somewhat darker externally, the hyphae highly gelatinized, confluent, with distinct, branched lumina 1.5-2 $\mu$  wide, or the apices distinctly limited, 4-7 $\mu$  in diameter, frequently brown, especially in the upper part. Hymenium

yellowish-brown above, often with coarse granular matter, hyaline below, KOH darkening above,  $50-65\mu$  thick, the paraphyses usually rather easily separable,  $2-2.5\mu$  in diameter, often brown and gradually or abruptly enlarged to  $4-6\mu$  above. Spores hyaline, non-septate, oblong to ellipsoid or occasionally subfusiform,  $9-14 (16) \times 3-5\mu$ .

On cedar bark, Boreas River C.C.C. Camp, 5174; known elsewhere from California (Hasse, in the Farlow Herbarium), and reported from Europe and Asia by Zahlbruckner.

88. *LECIDEA VERNALIS* (L.) Ach., Meth. Lich., p. 68. 1803.

*Lichen vernalis* L., Syst. Nat., ed. 12, vol. 3, p. 234. 1768.

Thallus thin and membranous to moderately thick and verruculose, the verrucules scattered or more often compacted, olivaceous-whitish to olivaceous or grayish-green, KOH-, I-. Hypothallus occasionally developed on bark specimens, black, thin. Apothecia  $0.3-1.2$  mm. wide, adnate to moderately constricted below, the disk usually convex and immarginate or rarely plane and distinctly marginate, whitish to commonly yellowish- or reddish-brown, bare. Hypothecium hyaline to pale yellowish or yellowish-brown, frequently darker above, the hyphae  $1.5-3\mu$  in diameter, with thin walls, vertically arranged above or rarely throughout, immersed in a gelatinous matrix. Exciple arising from the lower part of the hypothecium, hyaline or pale yellow or yellowish-brown, the hyphae radially arranged, conglutinate and immersed in a gelatinous matrix, slender, with thin walls. Hymenium hyaline to pale yellowish or yellowish-brown,  $60-85\mu$  thick, the paraphyses separable to rather coherent in KOH, usually slender or sometimes thickened to  $3\mu$  or rarely to  $5\mu$  above. Spores hyaline, non-septate or in part, especially in morbid specimens, becoming 1-septate, oblong or oblong-ellipsoid to ellipsoid,  $12-19 (21) \times 3-7\mu$ .

Over moss and bark, Chapel Pond, 3658, 3667, 3677, 3720; Newcomb, 4038, 4601, 4749, 4772, 4774, 5002, 5011, 5017, 5022, 5023, 5054; North Creek mainly at the Boreas River C.C.C. Camp, 5158, 5170, 5187, 5192, 5204; Mt. Marcy, 2781, 2793, 3220, 3320, 3322, 3348; Avalanche Lake, 6140; Seventh Lake, 4481, 4482, 4491, 6070; Warrensburg, 5680; reported from throughout the Northern Hemisphere.

The relation of this species to *L. subduplex* Nyl. and *L. helvola* (Koerb.) T. Fries could not be determined from the specimens available for examination. *L. subduplex* is apparently segregated on the basis of the spores becoming 1-septate in part, but the strong tendency of the spores of *L. vernalis*, as conceived above, to become 1-septate and even 3-septate, throws doubt on the validity of segregating *L. subduplex* on this basis. *L. helvola*, according to Vainio's description, differs in having smaller apothecia, in the structure of the hypothecium and the exciple, and in the generally smaller spores. All these characters, however, appear to intergrade with those of *L. vernalis*.

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